JUNE 1959

# TOOLING & PRODUCTION Magazine


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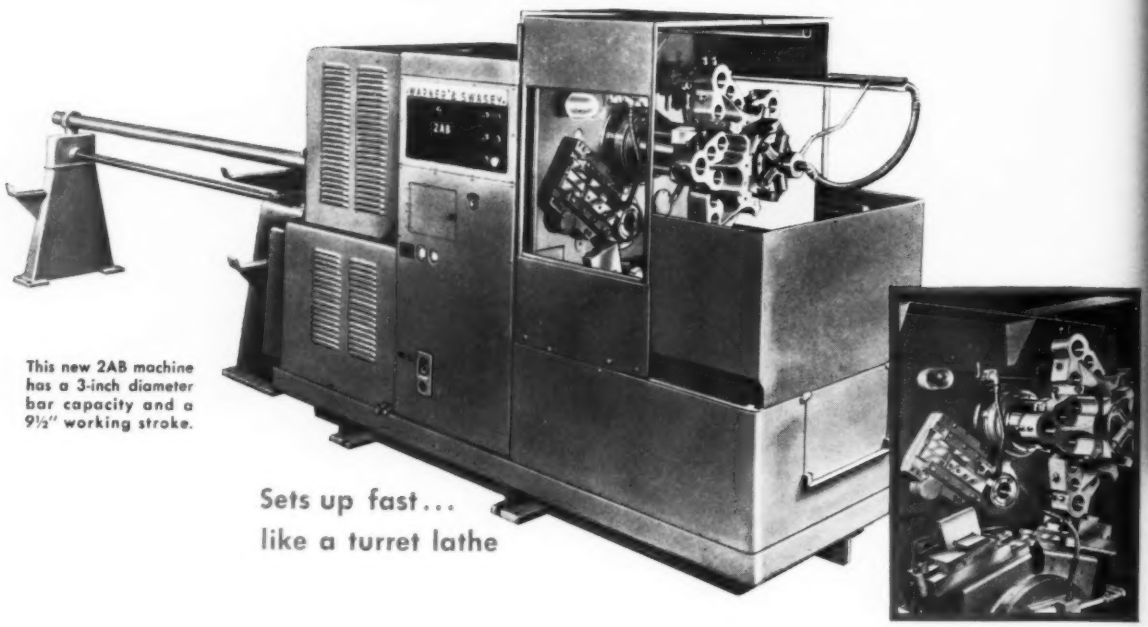
# NEW! Warner & Swasey 2AB Single Spindle Automatic Bar Machine

**...provides fast, automatic production of short, medium, or long-run precision bar jobs**



This new 2AB machine has a 3-inch diameter bar capacity and a 9½" working stroke.

Sets up fast... like a turret lathe

Now, the shop-proven, cost-cutting features which have made Warner & Swasey Automatic Chuckers so outstanding in their field are available in a new Single Spindle Bar Automatic. Most important among the profit- producing features of this new Warner & Swasey 2 AB are:

- **FASTER SETUPS**—With no cams to change, time-consuming set-up procedures, usually encountered with automatic bar machines, are eliminated. Even your smallest lot bar jobs can now be produced economically on an automatic basis.
- **GREATER ACCURACY**—Only two wide—and widely-spaced—bearing surfaces support the turret. Thus, cumulative tolerance problems in conventional "multiple bearing" turret location designs are eliminated.
- **EASIER TOOLING FOR COMPLEX WORK**—Flexibility and accessibility of the 2 AB's cross slides and pentagon turret enable the use of a wide variety of machining methods. One operation usually handles even the most complex workpieces.
- **POWER FOR TOMORROW'S JOBS —TODAY**—The 2 AB's 25 horsepower, reversible motor more than meets today's rugged metal removing requirements and, coupled with a wide range of spindle speeds, permits the efficient application of the latest cutting tool materials.
- **"FREE" CUT-OFF TIME**—An independently-operated cut-off slide allows full utilization of both front and rear cross slides. The cut-off cycle may be started during any one of the pentagon turret stations. Thus, cutoff can be progressing during subsequent machining providing a cut-off cycle which is virtually "free".
- **AUTOMATIC RESTOCKING INDICATOR**—This ingenious device in the hydraulic bar feed mechanism automatically stops the 2 AB and lights an indicator light on the operator's control panel before the bar being machined runs out—prevents tool damage from improperly-gripped stock.

Why not call your nearest Warner & Swasey Field Representative and get the complete story on the new 2 AB. It can help increase both production and overall profits—so important in today's highly competitive picture.

WARNER & SWASEY
*Cleveland*
PRECISION MACHINERY SINCE 1880

NO MATTER WHICH WAY YOU TURN...WARNER & SWASEY CUTS COSTS

CIRCLE INFORM-A-GRAM KEY NO. 2

# New Bliss ball bearing die sets shrink hours into minutes in die making and changeover!

**Here are seven reasons why...**

- Negative clearance means longer die life. No die shifting. Misalignment is eliminated.
- Ball bearing construction speeds assembly and disassembly. Yet installation is conventional. Die builder doesn't work in reverse.
- Smooth even preloading prevents shock...assures alignment of punch and die. Off-set design reduces wear.
- Easy oiling and maintenance. Loosen the set screw, the retainer is out and back in minutes.
- Eliminates downtime caused by seized pins and bushings.
- Standard components — no need to stock or wait for specials.
- Existing sets can be easily and economically converted to Bliss-Dieco ball bearing design.

Mfd. under U. S. Pat. 2,311,815

Note: Bliss-Dieco ball bearing assembly can be stripped from guide post on inclinable or straight side presses.

Bliss' patented ball bearing die set has money and time saving advantages no other die set has—conventional or otherwise. It gives you more burr-free parts between regrinds... fewer rejects.

It's the most revolutionary change in bearing design to hit the die industry in years. Assembly and disassembly are a snap. Die making and tryout time are slashed. No more time lost because of seized pins and bushings.

Pre-loaded ball bearings provide *negative clearance* for perfect die register, even after millions of hits.

What's more, cleaning and lubrication are a matter of minutes with this unique die set: You just loosen the self-locking set screw, drop the bearing retainer, clean it, reposition it and tighten the screw again. Light bearing oil is all that's needed.

In short, with the Bliss ball bearing die set you get maximum die life—"cleaner" parts – fewer die breakdowns. For further information, write E. W. Bliss Company, Die Supply Division, 1400 Brookpark Road, Cleveland, Ohio. We'll be glad to send you an illustrated technical bulletin that will tell you how you can have ball bearing die sets at a surprisingly low cost or how you can convert your existing die sets to the new Bliss-Dieco design.

**dieco** DIE SETS

**E. W. BLISS COMPANY**
**DIE SUPPLY DIVISION**
**Cleveland, Ohio**

CIRCLE INFORM-A-GRAM KEY NO. 3

highest finish!

get a perfect finish with PRESSURELOK®

Starting with the best Diamond wheel is not enough . . . it's the finish that counts. It costs you nothing to make more profit in your grinding operation.
PRESSURELOK builds optimum performance into every United States Diamond Wheel —yet your carbide grinding costs may be reduced by using a different type, size, grit or hardness of wheel from which you are now using.
United States Diamond Wheel Co. is pioneering on-the-job "Progressive Specification" to warrantee you the top carbide grinding efficiency.

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CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

JUNE 1959
VOL. XXV No. 3
GEORGE J. HUEBNER, Founder
1885 - 1956

## PERSONALLY SPEAKING

Dear T & P Reader:

During the first week in May, the Technical Press was introduced to Latrobe Steel Company's new consumable electrode vacuum furnace. There is a technical description of this new tool steel refining method in another part of this issue of T & P and I urge you to read it. The purity of the tool steel coming from this new furnace will be to standards never before realized. Perhaps it will answer a problem for you. Keep it in mind.

Since we're speaking of steel, I heard a few remarks last night that might bear repeating. From what I was told, I would guess that the union negotiators are not a bit impressed with the present living standards of the steel union's members. Frankly, I'm very much in favor of everybody participating in the same benefits that are being sought. For example, I understand that one demand is that every worker, in addition to regular annual paid vacations, also must receive a three months' furlough with pay every five years. Why not also ask for full pay for the duration of any strike? If they are going to have Utopia, they might as well go all of the way right away.

Still on the question of steel, let me call your attention to a feature in this issue called "Your Guide to Heat Treating Equipment." Our staff made a thorough study of this subject and we believe you will find the resulting guide worth keeping for future reference. Heat treating is an ever-present requirement and problem, and an accurate list of sources for any and all types of heat treating equipment, we believe, can be of great value very often.

Cordially yours,

Ray Huebner

Publisher

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Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office Address: P.O. Box 1494, Louisville, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.

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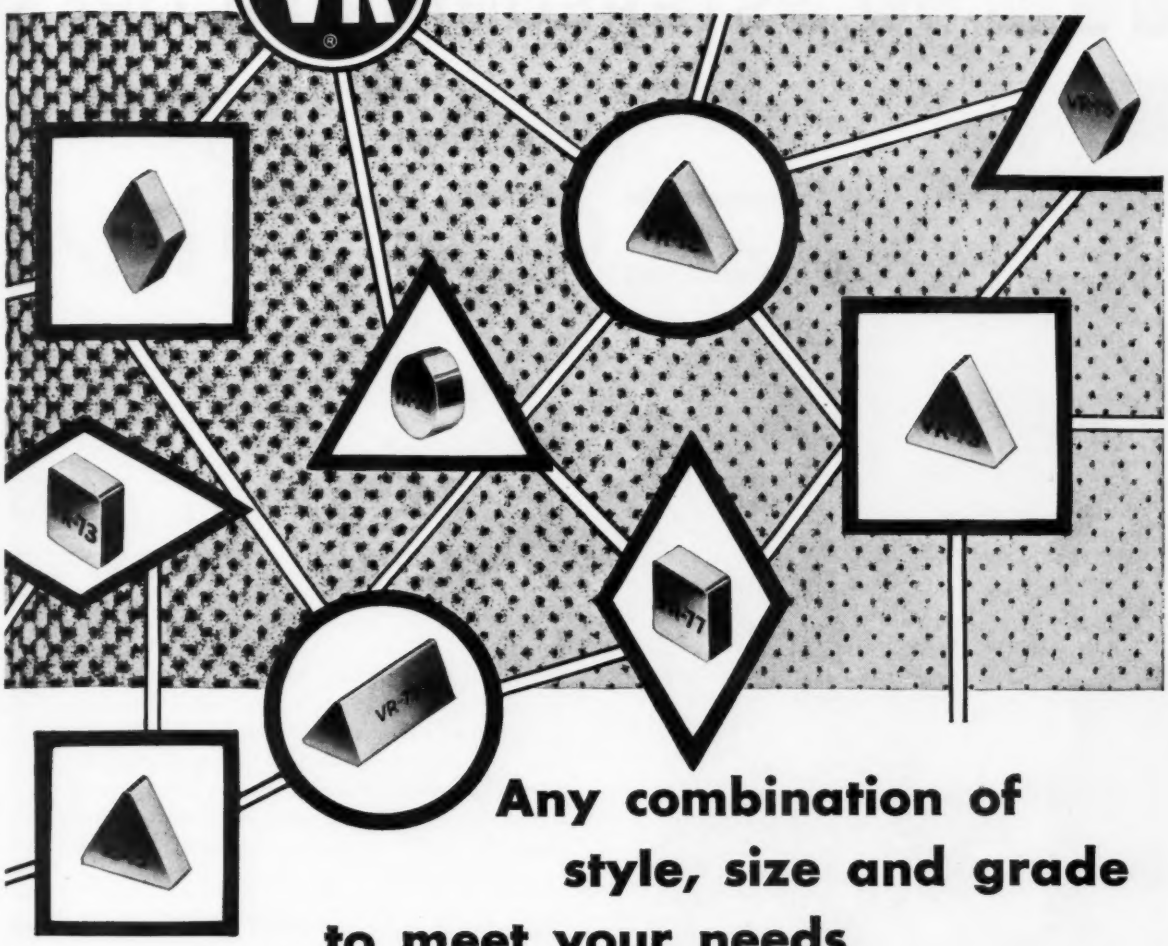
# V-R carbide inserts...




## Any combination of style, size and grade to meet your needs

V-R Elevator Type Toolholder.

V-R Solid Base Type Toolholder.

Complete machining flexibility is possible only when you can get exactly the right combination of carbide insert grade, size and style . . . when you need it. That's why V-R manufactures the *most complete line* of inserts available anywhere. Regardless of the operation to be performed or the type of material to be machined, there's a V-R carbide insert that's best for your job. Ask your V-R representative. He will be glad to show you how V-R's complete line can provide fast answers to your cutting tool problems.

Send for Catalog VR-58 for complete details.

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CIRCLE INFORM-A-GRAM KEY NO. 6

# MEET MRS. PETER PEFF

## ...and her company's new lightweight liquid-oxygen "vacuum bottle" for jet planes

Mrs. Peff, president, Superior Air Products, Newark, N. J., with Supairco's recently developed liquid-oxygen "vacuum bottle."

MANY a tough problem has been solved by Mrs. Peff and her company since 1952, when she assumed the presidency after her husband's death. Specialists in building low-temperature apparatus and complete plants to produce oxygen and other gases, "Supairco" was asked recently to develop a light, compact container to supply oxygen for aircraft crews at high altitudes.

Ingenious design utilizing the broad and varied properties available in copper and its alloys produced the "vacuum bottle" shown above. The inner sphere is of Everdur®, Anaconda copper-silicon alloy, which has the workability and resistance to corrosion needed —and, more important, the strength and toughness to make possible a relatively thin, light shell that can withstand vibration and fatigue stresses aloft—plus shocks from catapult launchings and carrier landings. The outer shell is of Anaconda copper, highly polished to reflect heat. This, plus a vacuum under .001 microns between the spheres, holds liquid oxygen at —297 F.

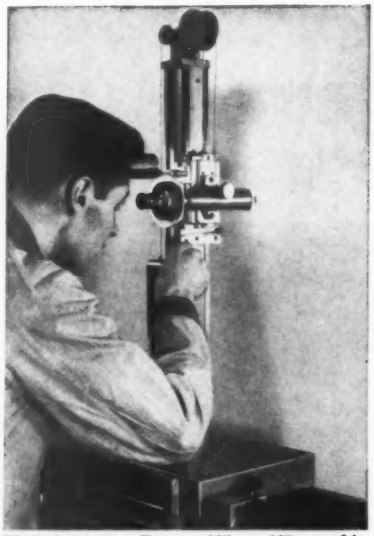
Starting with over 100 standard copper alloys, Anaconda can provide an almost unlimited number of combinations of useful properties. When new and unusual problems arise, use Anaconda technical specialists to help you select metals for your needs. Address the American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5941

**LEFT:** Inside the copper shell in main illustration is this slightly smaller liquid-oxygen container made of Everdur, the metal that spins and machines readily, is easy to join by soldering, brazing, welding. **RIGHT:** Completed liquid-oxygen converter, built by Mine Safety Appliances Company, Pittsburgh, Pa., serves 8-man crew. It is one-third the weight of the cylinder it replaces, takes much less space.

**ANACONDA®**

**COPPER • BRASS • BRONZE**
**NICKEL SILVER MILL PRODUCTS**
*Made by The American Brass Company*

CIRCLE INFORM-A-GRAM KEY NO. 7



M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

## Cut inspection time in half

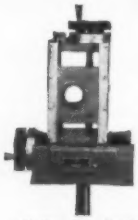
***with new Gaertner Coordinate Cathetometers***

These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

Because these are optical rather than mechanical measuring instruments, you make non-destructive measurements without contact, distortion, or concern about pressure being applied to the object when making a setting. Instruments available in English or Metric system.

M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.



M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53 & 194-57

**The Gaertner Scientific Corporation**

1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 8


# MANUFACTURING MEMOS

**Leaded Steel Moves Up . . .** Demand for leaded steel by automatic screw machine users almost doubled last year, says United States Steel. In 1958, 46.6% of all steel bar stock used was leaded; in the previous year only 25% of the steel used was leaded. Because of this upsurge, USS recently opened a new Bessemer leaded steel production facility at its National Tube Division Works in Lorain, Ohio.

**Ultra-Weldings . . .** The ultrasonic vibrations used, among other things, to drill your teeth, are now being adapted for use with conventional welding methods to improve joining of metals, reports Battelle Memorial Institute. There're a few kinks to straighten out yet, but researchers have high hopes for using this method even for joining dissimilar metals like molybdenum and steel.

**King-Sized Presses, Too . . .** A giant-size die tryout press, largest of its type ever built, has been installed in Royal Oak Tool & Machine Co.'s plant, which completes another step in their retooling program. This 300-ton, four-column, double back-geared, under-drive design type was built by Alpha Press & Machine, Inc., and will be used for tryout and also for initial production runs to assist customers in getting jobs underway.

**Movie Marquee . . .** The latest edition of the Industrial Management Society film rental catalog lists 77 films describing American work simplification and industrial engineering training projects. Get a brochure from the Society at 330 S. Wells St., Chicago 6.

**"Brush Your Teeth With . . ."** Collapsible tubes for toothpaste, drugs, and shaving cream used over 24-million pounds of metals last year. Lead took the lead with 13,777,000 pounds, aluminum was second with 8-million, and tin made a little dent in the market with 1-million pounds. Dentifrices continued as the largest consumer of metal for packaging, using almost 12-million pounds of the metals.

**Round We Go . . .** First concrete was poured for the first section of the ring girder of the new Public Auditorium that's going up in Pittsburgh. This is the beginning of the track for the tricky stainless steel retractable roof for the circular building that'll be opened in 1961.

**New Glass Blowers . . .** Beginning in 1960, Chrysler Corp. will fabricate about 50% of its own automotive glass, announces L. L. Colbert, president. Windshields, back lights, windows, and other glass parts will be produced in the company's McGraw Plant in Detroit.

**Planning Team . . .** The shop man needs a bridge between what he's doing now and some types of operations research, says Harry D. Hall, director of General Motors Process Development Section. This bridge is a planning team activity for cost reduction. The "shop man's operations research" uses a methods engineering approach and progresses through seven steps, from determining the problem to checking the results.

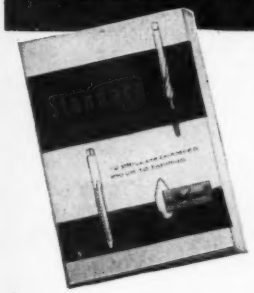
# NOW

FOR DRILLING and CHAMFERING PRIOR TO TAPPING

***IMMEDIATELY AVAILABLE—***

ALL PRACTICAL SIZES—IN 3 STEP LENGTHS 3 SHANK STYLES

with Straight Shank, Tapered Shank or Jobbers Length



**Just off the press! This new 12-page Catalog illustrates the multiple advantages of Drilling and Chamfering (prior to tapping) with Mohawk Standard Subland Drills. Lists all practical sizes, types and suggests a simplified method of determining your requirements—more economically. Yours for the Asking!**

# Standard SUBLAND DRILLS IN LOCAL STOCKS

**Now . . . Mohawk Subland Drills are manufactured in *all* practical *standard* sizes, in 3 step lengths and 3 shank styles—to meet all drilling-chamfering requirements. And, Mohawk Standard Sublands sizes match accepted industry practice on unified thread sizes, hole tolerances, etc.**

**Why? Because Mohawk Standard Sublands affords a faster, more accurate, economical method of simultaneously drilling and chamfering clean, concentric holes for better tapping operations—plus a saving in tap costs.**

**Mohawk Standard Subland Drills are available direct from your local distributor's stock—immediately! Start saving production time and equipment dollars today. Call the Mohawk man right now!**

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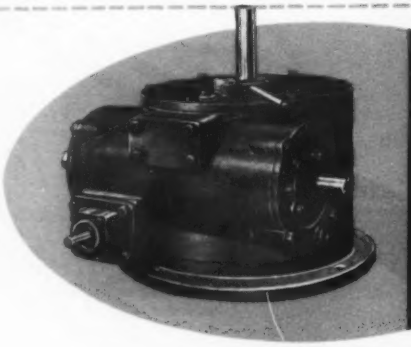
Mohawk TOOLS, Inc.

**MONTPELIER, OHIO**

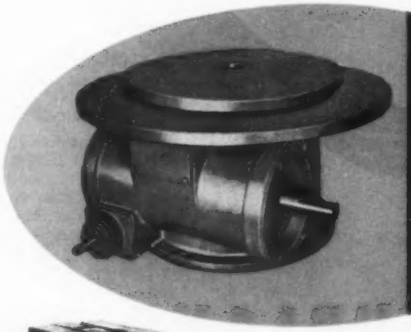
CIRCLE INFORM-A-GRAM KEY NO. 9

You can
PRODUCE & ASSEMBLE
Automatically
when your machine is designed around a Standard Tool
INDEXING UNIT

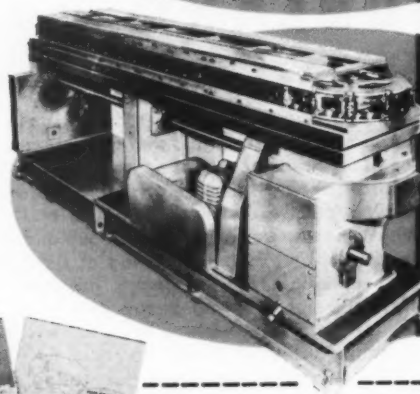
The Heart of Automatic Machines



MODEL ST-A9A
Compact light to medium duty cam indexing unit. 8 to 20 index positions. 90° to 270° cams. 13½" to 24" dial plates. Accuracy ± .001 at 8" radius.



MODEL ST-A9B
Heavy duty cam indexing unit. 8 to 24 index positions. 18" to 24" dial plates. Accuracy ± .001 at 10½" radius. Production rate 600 to 6000 per hour.



MODEL ST-A18
Conveyor or transfer type, straight line indexing chassis. 27 to 51 work carriers. Production rate 1200 to 6000 per hour. Station distances 4" to 6". Accuracy ± .003.

*Technical Booklets Sent on Request!*

*Standard Tool engineers will be pleased to help you in selecting the indexing unit to meet your exact requirements.*
*Also ask for Standard Tool facilities brochure.*

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Machines for Shaping America's Future
250 LAUREL AVENUE KEARNY, NEW JERSEY
STANDARD TOOL AUTOMATION
Since 1910
CIRCLE INFORM-A-GRAM KEY NO. 10

## MANUFACTURING MEMOS

**New Handle**
The Systems Division of Consolidated Electrodynamics Corp. is now known as Consolidated Systems Corp. Kenneth W. Patrick is president and Philip S. Fogg, chairman of the board.

**Signed and Sealed**
Snyder Corp. purchased the Hope Machine Co., 50 year old milling machine builder.
The assets of the Permattach Diamond Tool Co., Inc. have been acquired by Hitchiner Mfg. Co.

**New Division**
A contract division to handle all types of sub-contract work was established recently by Kearney & Trecker.

**On The Move**
Operations of the Potter & Johnston Co., a subsidiary of Pratt & Whitney Co., Inc., recently moved into the new plant of the parent company in West Hartford, Conn.
Key personnel and plant equipment of Madison-Faessler are on the move to the home of their parent company, Madison Industries, in Providence. Now all operations will be in one area, making complete information and service on hole-making problems available from one source.

**Distributors**
Industrial Chemical and Equipment Co. was recently appointed by Hanson - Van Winkle - Munning Co., as representatives in Minnesota, North and South Dakota, and western Wisconsin.

New distributors for Dahlstrom Machine Works are Hart Industrial Supply Co. of Oklahoma City; Delaware Valley Machinery Co., Willow Grove, Pa.; and Austin-Hastings Co. Inc., Cambridge, Mass.

Products of Latrobe Steel Co. are being distributed by Harold E. Smith Co. of Lancaster, Pa.

Production Equipment Co. is a new dealer for Clearing, division of U. S. Industries, Inc. in the central and eastern Michigan area.

Pratt & Whitney Co., Inc. is now handling precision lathes manufactured by The Wade Tool Co.

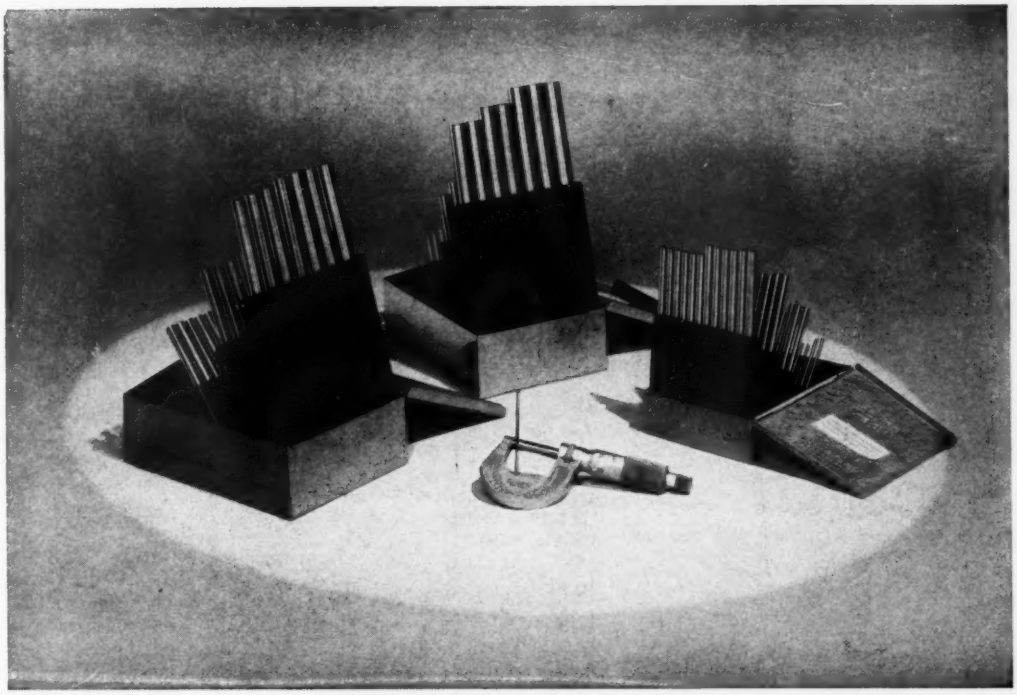
Southern Florida is Paul Beel's sales territory for A. Milne & Co., Inc.

DRexel 6-4222 ESTABLISHED 1827

WILLIAM T. HUTCHINSON CO.

53 BROWN AVENUE SPRINGFIELD, NEW JERSEY

# HUTCHINSON HSS BLANKS



**115 Pieces – COMPLETE – .040" to .500" – $88.00**

your choice of two tolerances
+ .0002" — .0000
or
+ .0000 — .0002"

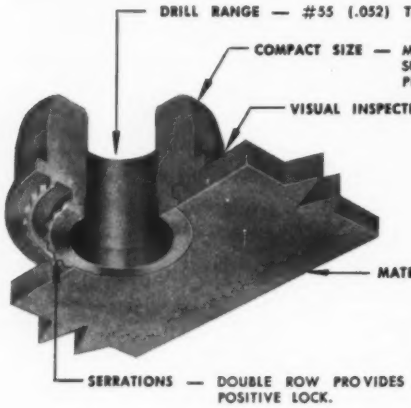
| JOBBER SET | LETTER SET | WIRE SET |
|---|---|---|
| $32.27 | $29.03 | $27.40 |
| in Huot Index | in Huot Index | in Huot Index |

**HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish. parallel ground**

**ANY DECIMAL DIAMETER OF STANDARD LENGTH .020" TO 1.000" SHIPPED ON 24 HOUR NOTICE**

CIRCLE INFORM-A-GRAM KEY NO. 11

## FOR REAL DRILL TOOLING ECONOMY


DRILL RANGE — #55 (.052) THRU 9/64 (.1406).
COMPACT SIZE — MINIMUM HEIGHT ADEQUATELY SUPPORTS DRILL, DIAMETER PERMITS CLOSE LAYOUT.
VISUAL INSPECTION — WHEN BUSHING IS FULLY INSTALLED, ITS SHOULDER SEATS ON TEMPLATE.
MATERIAL — INSTALLED IN .060 OR THICKER ALUMINUM.
SERRATIONS — DOUBLE ROW PROVIDES POSITIVE LOCK.

Inexpensive Press Type Anchor Bushings are simply pressed into punched (or drilled) holes in .060 or thicker aluminum drill templates and offer durable tooling life for high or low volume production.

The compact sizes of these bushings allow you to lay out very close hole patterns, yet the bushings provide the necessary drill support for perpendicular drilling. The double row of serrations at the base provides a positive lock between the bushing and the template to resist drill torque or template abuse.

To simplify template hole preparation, drill sizes are accommodated by only three sizes of bushings:

**AB90** #55 (.052) THRU 9/64 (.1406)
**AB91** #27 (.144) THRU "F" (.257)
**AB92** #G (.261) THRU 7/16 (.4375)

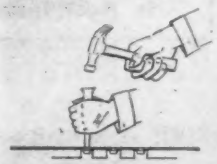
WRITE FOR OUR NEW BROCHURE ON PRESS TYPE ANCHOR BUSHINGS. IT TELLS HOW TOOLING ECONOMIES ARE OBTAINED, GIVES LAYOUT DIMENSIONS, INSTALLATION AND REMOVAL DATA, AS WELL AS ORDERING INFORMATION.

**INSTALLATION**

1
DRILL OR PUNCH HOLE IN TEMPLATE TO MATCH BUSHING PILOT DIAMETER.

2
PRESS BUSHING INTO TEMPLATE HOLE.

**REMOVAL**



KNOCK-OUT BUSHING FROM UNDERSIDE OF TEMPLATE.

hi-shear RIVET TOOL COMPANY
2600 WEST 247TH STREET • TORRANCE, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 12


## MANUFACTURING MEMOS

**Study Lab**
A new laboratory to study effects of radiation upon various materials and fuels will be built in the next year at the Connecticut Aircraft Nuclear Engine Lab. It'll be built by the Air Force and staffed by a Pratt & Whitney technical team.

**Expanding**
Latest expansion of Zero Mfg. Co. of Burbank, Calif., is the acquisition of White Aircraft Corp. Zero's business has increased seven-fold in as many years and the new White division will give them a hand for producing metal enclosures in Palmer, Mass.

**New Lines**
The development of special production machinery is the task set for the new Aircraft and Missile Division of U. S. Industries, Inc. Their Clearing Division now handles the new Clearing-Harrison lathe line, manufactured by T. J. Harrison & Sons, Ltd. of England. Clearing sells and services these machines, made to their own specifications.

**Coming Events**
*June 7-12.* Pennsylvania State University's Machinability Seminar, University Park, Pa.
*June 9-11.* The Materials Handling Institute's Exposition of 1959, Cleveland Public Auditorium, Cleveland.
*June 11-12.* Pressed Metal Institute's National Sales Seminar, Bedford Springs Hotel, Bedford, Pa.
*June 14-18.* American Society of Mechanical Engineers' Semi-Annual Meeting, Chase-Park Plaza Hotels, St. Louis.
*June 14-19.* Society of Automotive Engineers' Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.
*June 19.* "Plastics in the Automotive Industry" meeting, Detroit Section, Society of Plastics Engineers, Inc., and Plastics in the Automotive Industry PAG.

## DEATHS

Henry B. Austin, 61, vice president-sales of Armstrong Bros. Tool Co., died Feb. 26 in Glockner Penrose Hospital, Colorado Springs, Colo.

Meredith Spear, 51, production manager at AC Spark Plug, died in Elm Grove, Wis., April 14.

CIRCLE INFORM-A-GRAM KEY NO. 13 →

HARDINGE
ELMIRA, N.Y.

# EASY READING HARDINGE BLACK AND WHITE DIALS

## MEAN INCREASED PRODUCTION . . .

. . . **HARDINGE** developed these fast setting easy reading **black and white dials** — they assure maximum accuracy with high production.

**Pioneered** with the Hardinge High Speed Precision Tool Room Lathe model HLV shown here — **Hardinge black and white dials** are now standard equipment at **no extra cost** on all of our tool room and production machines.

Invest in Hardinge equipment for product improvement and increased production. Ask for bulletin on our tool room and production machines.

**HARDINGE BROTHERS, INC.**
**ELMIRA, N. Y.**

# INTRICATE SHAPES MADE EASY WITH GRAPH-AIR®

*hardens at 200° to 300° lower than most air-hardening tool steels*

YOU can make intricate shapes like these easier and at less cost with versatile Graph-Air tool steel. Here's why:

1) **GRAPH-AIR AIR-HARDENS FROM AS LOW AS 1450°F.** That's as much as 400 degrees lower than most air-hardening tool steels. You reduce distortion, simplify heat treating control, minimize scaling and decarburization.

2) **GRAPH-AIR MACHINES FASTER.** The free graphite in its structure makes it machine 30% faster than ordinary tool steels. Means more production for you.

3) **GRAPH-AIR HAS MORE STABILITY.** It's one of the Timken Company's graphitic tool steels, the most stable tool steels ever made. Tests prove it. And that means longer accuracy for parts made of Graph-Air.

Uniform hardening, reduced distortion and all its other advantages allow you to machine Graph-Air into more intricate sections. It's a money-saving solution for blanking dies or other steel parts that must withstand abuse. For the best tool steel to make intricate shapes—the one that air-hardens at lower temperatures—specify Graph-Air. Available in solid and hollow bar sizes. Our metallurgists will help you select the most economical size for your needs. Write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

**WHEN YOU BUY TIMKEN STEEL YOU GET . . .**

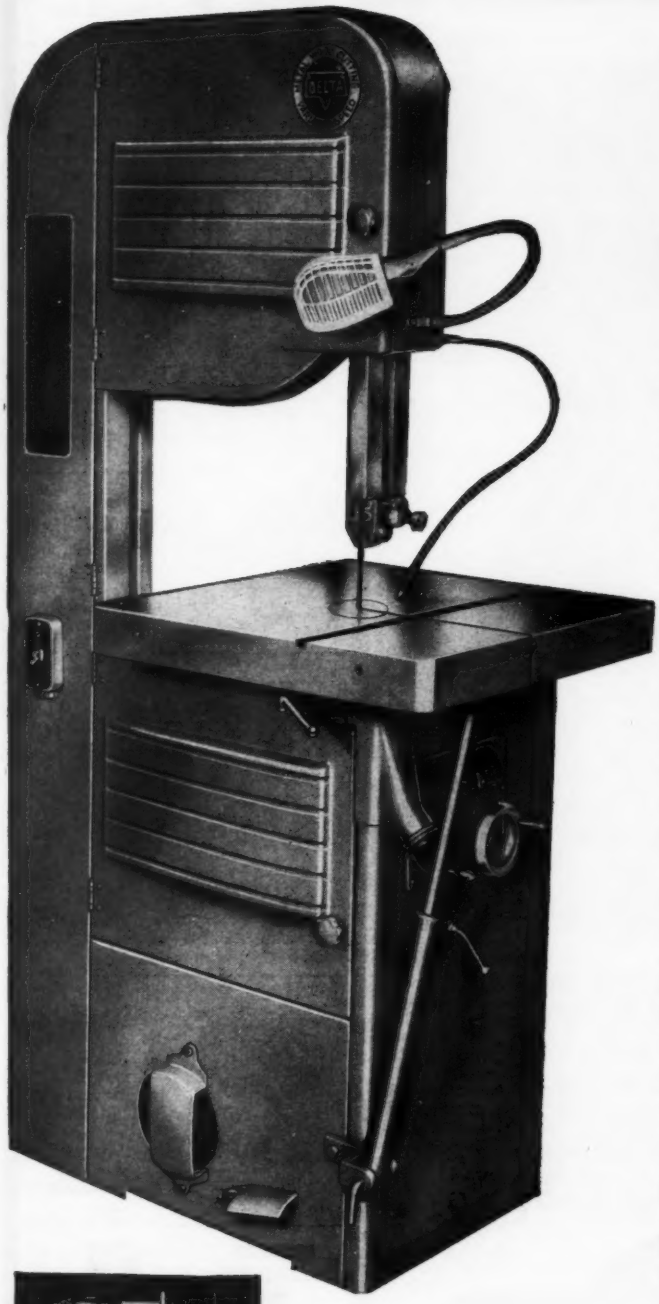
1. Quality that's uniform from heat to heat, bar to bar, order to order
2. Service from the experts in specialty steels
3. Over 40 years experience in solving tough steel problems

# TIMKEN® *Fine Alloy* STEEL

**TIMKEN GRAPHITIC STEELS ARE CARRIED IN STOCK BY 9 DISTRIBUTORS WITH 42 WAREHOUSES IN 31 CITIES IN THE UNITED STATES AND CANADA**

CIRCLE INFORM-A-GRAM KEY NO. 14

# NEW from DELTA



## 20" metal-wood *variable speed* BAND SAW

No matter what your cutting requirements —in the foundry, toolroom or pattern shop —this all-new Delta 20" Metal-Wood Band Saw gives you real on-the-job performance. Now—*for less than $900.00*—you can have the features you said you wanted most for greater accuracy and better cutting:

**WIDE RANGE VARIABLE SPEED DRIVE ...** gives you a tremendous speed range—50 to 4500 FPM—for cutting everything from stainless steel to aluminum, wood and plastics. This versatility can't be equalled.

**SCIENTIFICALLY DESIGNED BLADE GUIDES ...** ideal for heavy metal cutting because they furnish more "close up" blade support than conventional type guides. These new Delta blade guides are the key to better accuracy, straighter cuts, and longer blade life.

**RUGGED FRAME CONSTRUCTION ...** features a massive, rigid internal frame with a modern fabricated exterior. Exclusive 3-point adjustability (wheels, upper guide and table) assures perfect alignment of key components.

In addition to these outstanding features you get a massive table with double trunnion support, convenient speed controls, plus built in chip blower *at no extra cost.*

**SEE IT AT YOUR NEAREST DELTA DEALER**— he's listed under "TOOLS" in the Yellow Pages —or write: Rockwell Manufacturing Company, Delta Power Tool Division, 622F N. Lexington Ave., Pittsburgh 8, Pa.

**BLADE WELDER,** including shear and grinder, shown on No. 28-462. Bracket mounted on 20" Band Saw for machine-side use. (Optional accessories)

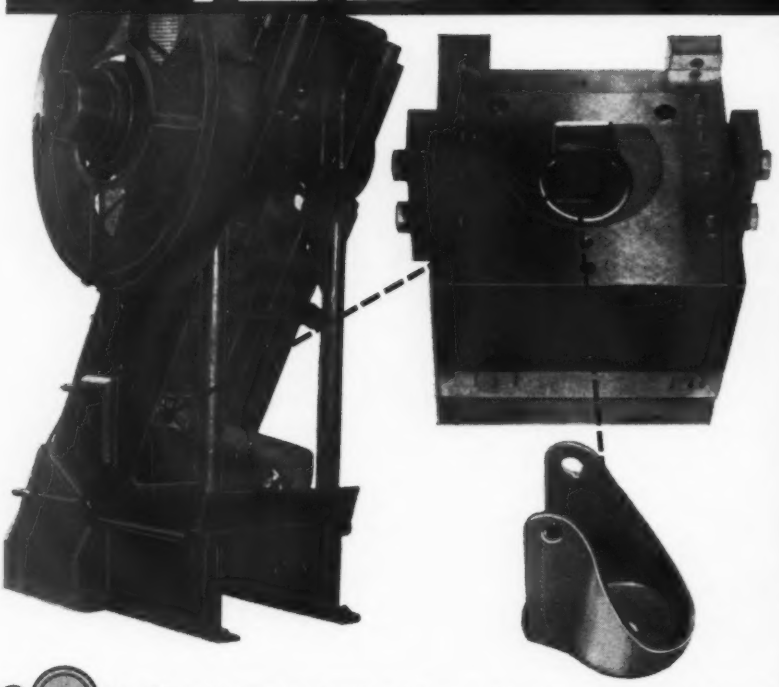
DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 15

# Talide® DIE IN SERVICE 8 YEARS DRAWS 9,000,000 CASTER PARTS!

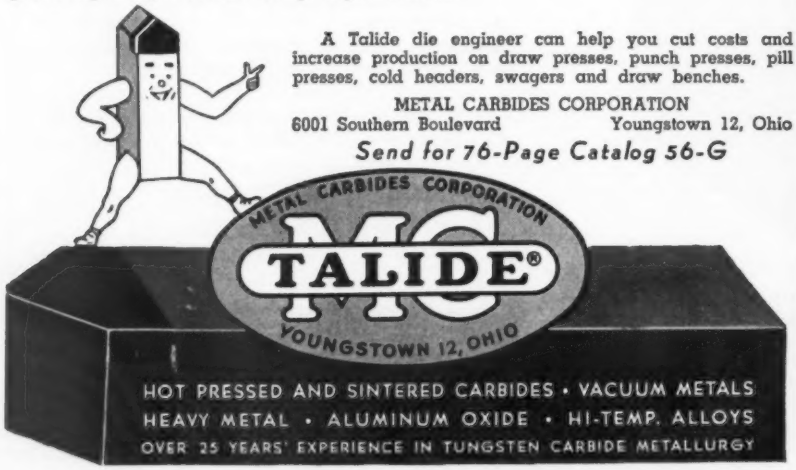


**Bassick COMPANY**, Bridgeport, Connecticut, leading producer of casters, chair controls, automobile and specialty hardware, was experiencing difficulty drawing an eccentric shaped chair caster part from commercial quality hot rolled drawing steel.

Scrap rate was high—production per die low. The high-speed steel die being used (costing $350.00) had to be reground and polished every 30,000 pieces, and replaced several times a year.

A Grade C-85 Talide die (costing $1100.00) was installed in 1950 and to date has produced over 9,000,000 caster parts. During this 8-year production run, the Talide die has required no servicing and is still in operation.

Bassick Company engineers report that the quality of their product has been improved. Surface marks and scratches, caused by scoring and galling of the steel dies previously used, have been completely eliminated.

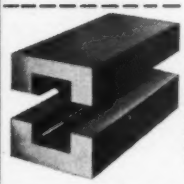

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

A Talide die engineer can help you cut costs and increase production on draw presses, punch presses, pill presses, cold headers, swagers and draw benches.

METAL CARBIDES CORPORATION
6001 Southern Boulevard Youngstown 12, Ohio

*Send for 76-Page Catalog 56-G*

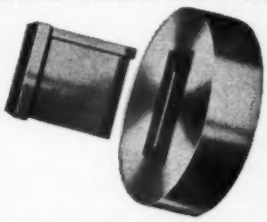
**WIRE DIES**
Hundreds of miles of steel and non-ferrous wire—.004 to .750—drawn through TALIDE dies.



**SWAGING DIES**
Leading fountain pen manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

**HEADING AND EXTRUSION DIES**
Cold heading ¼" C-1008 rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

**CURLING ROLLERS**
TALIDE curling rolls last 65 times longer than steel rolls on beverage can forming operation.



**BLANKING AND FORMING DIES**
70 times more paper discs blanked out with TALIDE—over hard alloy die.

**SHEET METAL DIES**

137,000 hi-alloy steel pressure vessels drawn with TALIDE against only 7,900 with steel dies previously used.

**POWDERED METALLURGY DIES**
Compacting highly abrasive chemical powders, TALIDE pill dies last 4 months; steel dies wore out in 6 hours.

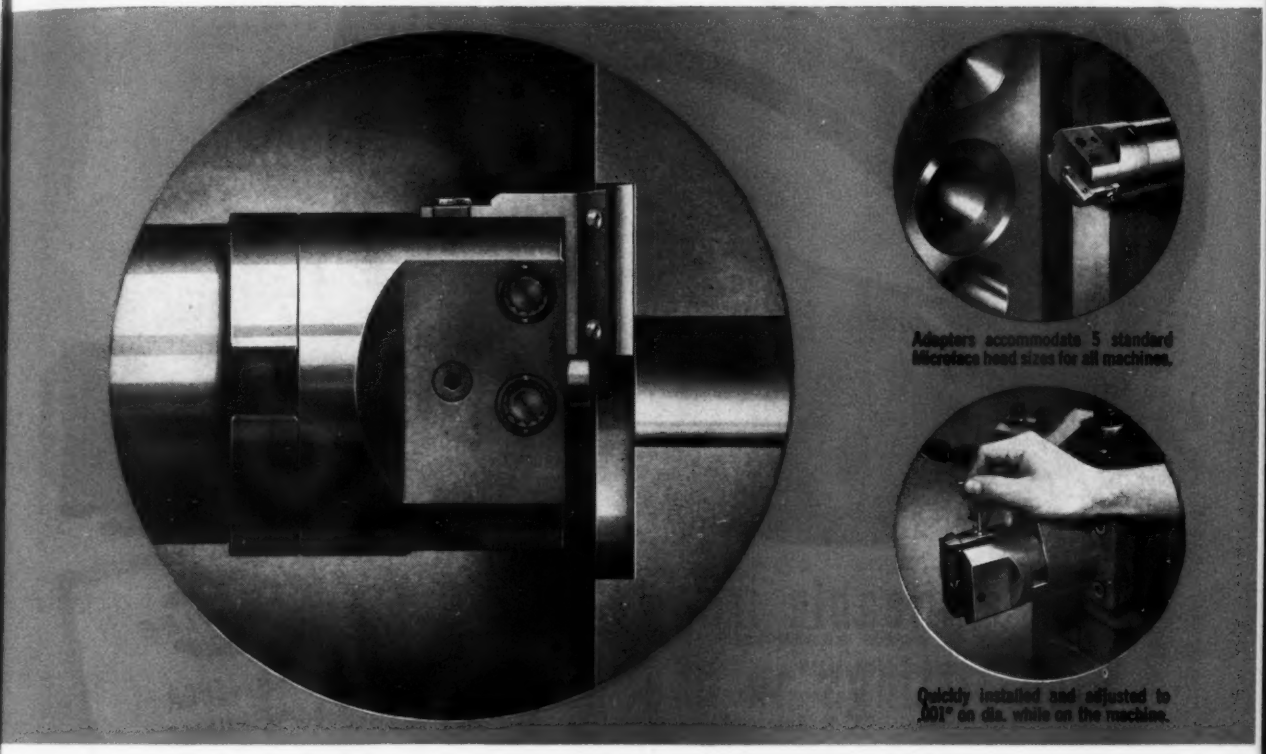
CIRCLE INFORM-A-GRAM KEY NO. 16

NEW FROM **FAIR STREET** • HOME OF MICROBORE

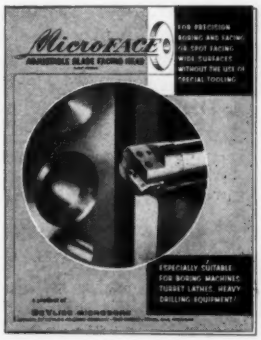
# microface®

# ADJUSTABLE BLADE FACING HEAD

(Patent Pending)


Adapters accommodate 5 standard Microface head sizes for all machines.
Quickly installed and adjusted to .001" on dia. while on the machine.

**For boring machines, turret lathes and heavy drilling equipment,** this new addition to the Microbore Tooling System bores, faces or spot faces wide surfaces from 1½" to 8½" dia. without special tooling. Often eliminates the necessity of generating faces by slow cross feed methods. Dovetail blade holder mounting in the rugged, one-piece head eliminates chatter, assures consistent accuracy, fine surface finish and prolongs blade life. Adjustment of interchangeable high-speed steel or carbide blades is fast and accurate. *Blades replaceable with a minimum of down time without removing head from the machine.*


MicroFACE®
ADJUSTABLE BLADE FACING HEAD
FOR PRECISION BORING AND FACING FOR SPOT FACING WIDE SURFACES WITHOUT THE USE OF SPECIAL TOOLING
ESPECIALLY SUITABLE FOR BORING MACHINES, TURRET LATHES, HEAVY DRILLING EQUIPMENT

Write for technical 4-page brochure.

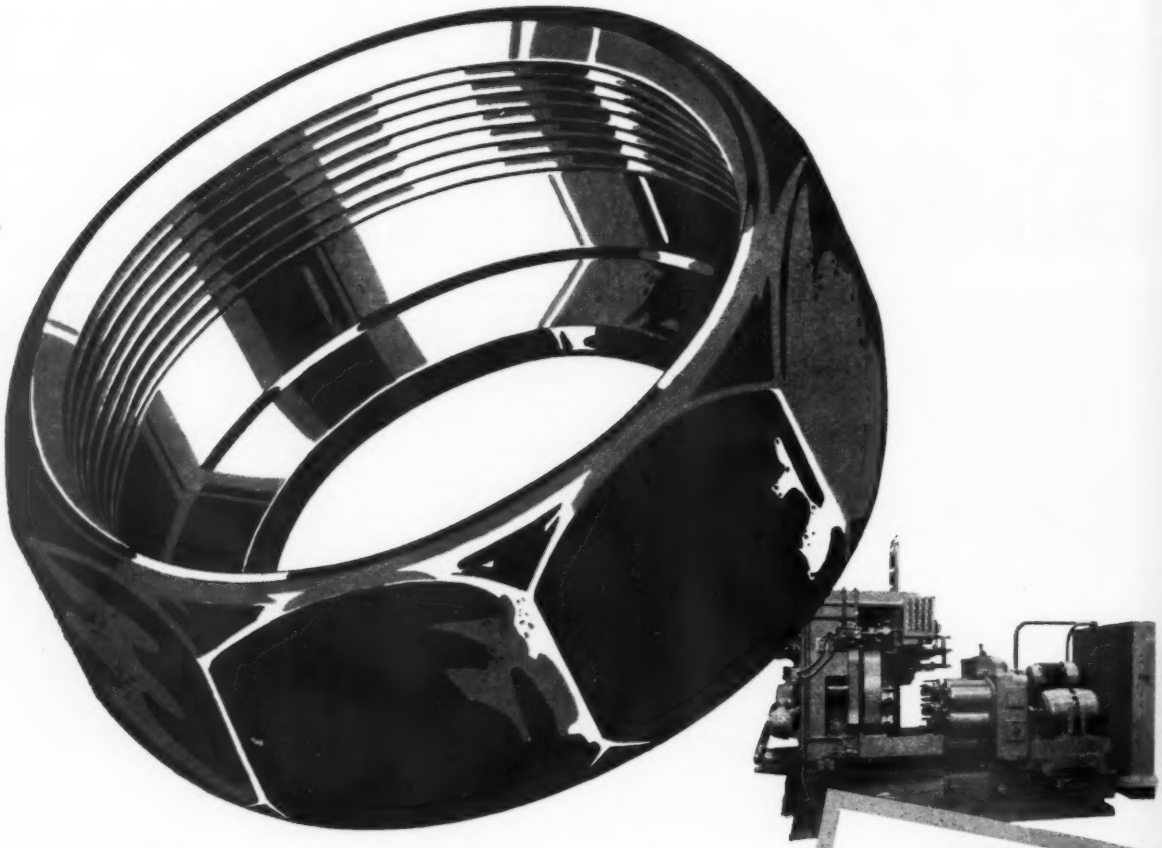
## DeVlieg® Microbore® System

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

*Fair Street, Royal Oak, Michigan*

**CIRCLE INFORM-A-GRAM KEY NO. 17**

*...an example of Automatic Production by Greenlee...*



# 700 malleable iron pipe fittings an hour...

The Greenlee 5 station, horizontal, automatic indexing machine shown above was designed and built for high-production machining of malleable iron pipe fittings. The pipe fittings are loaded, four at a time, indexed and machined at the rate of 576 to 712 pieces an hour, depending on size. The machine accommodates five different sizes of fittings.

STATION 1 — automatic load
STATION 2 — bore and rough counter-bore
STATION 3 — finish counter-bore and chamfer
STATION 4 — tap
STATION 5 — automatic unload

Let a Greenlee representative show you the modern Greenlee approach to automatic production.

*MACHINES DESIGNED . . .*
*WITH THE FUTURE IN MIND*

GREENLEE

TRANSFER MACHINES

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Units
- Die Casting Machines
- Trim Presses

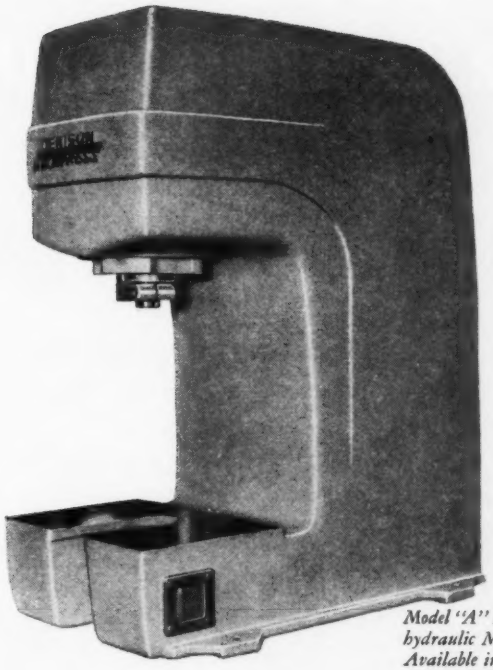
**GREENLEE BROS. & CO.**

**1702 MASON AVE.**
**ROCKFORD, ILLINOIS**

CIRCLE INFORM-A-GRAM KEY NO. 18

*FROM DENISON*

a small hydraulic press so productive it...



*Model "A" Denison hydraulic Multipress. Available in 1-ton and 2-ton ram capacity.*

# Guarantees your savings

**If in 45 days the Denison Model "A" Multipress does not cut your production costs or does not improve production quality, simplify operation or give your shop more versatility, simply return the press. You pay only for the freight. FOR ANY JOB ASSEMBLY, FORMING, STAKING...101 MORE**

1. High-speed cycle time
2. Easy pressure adjustment
3. Foolproof safety controls
4. Manual or automatic operation
5. Ample 8" daylight for tooling
6. Compact... only 24" high
7. Lightweight... just 225 pounds
8. Smooth, controlled hydraulic pressure does all your pressing jobs better and faster
9. Now available in both 1-ton and 2-ton capacity

**1-ton $395**
**2-ton $595**

*Write for a detailed bulletin*

**DENISON ENGINEERING DIVISION**
**American Brake Shoe Co.**
1197 Dublin Road • Columbus 16, Ohio

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- **DETROIT** 900 W. Maple Road Troy, Michigan
- **HOUSTON** 3315 West 12th St. Houston 24, Texas
- **CLEVELAND** 5530 State Road Cleveland 34, Ohio
- **ATLANTA** 309 East Paces Ferry Rd., N.E. Atlanta 5, Georgia
- **CHICAGO** 7000 West 63rd St. Chicago 38, Illinois
- **NEWARK** 315 Central Avenue Clark, New Jersey
- **DAYTON** 2801 For Hills Ave. Dayton 19, Ohio

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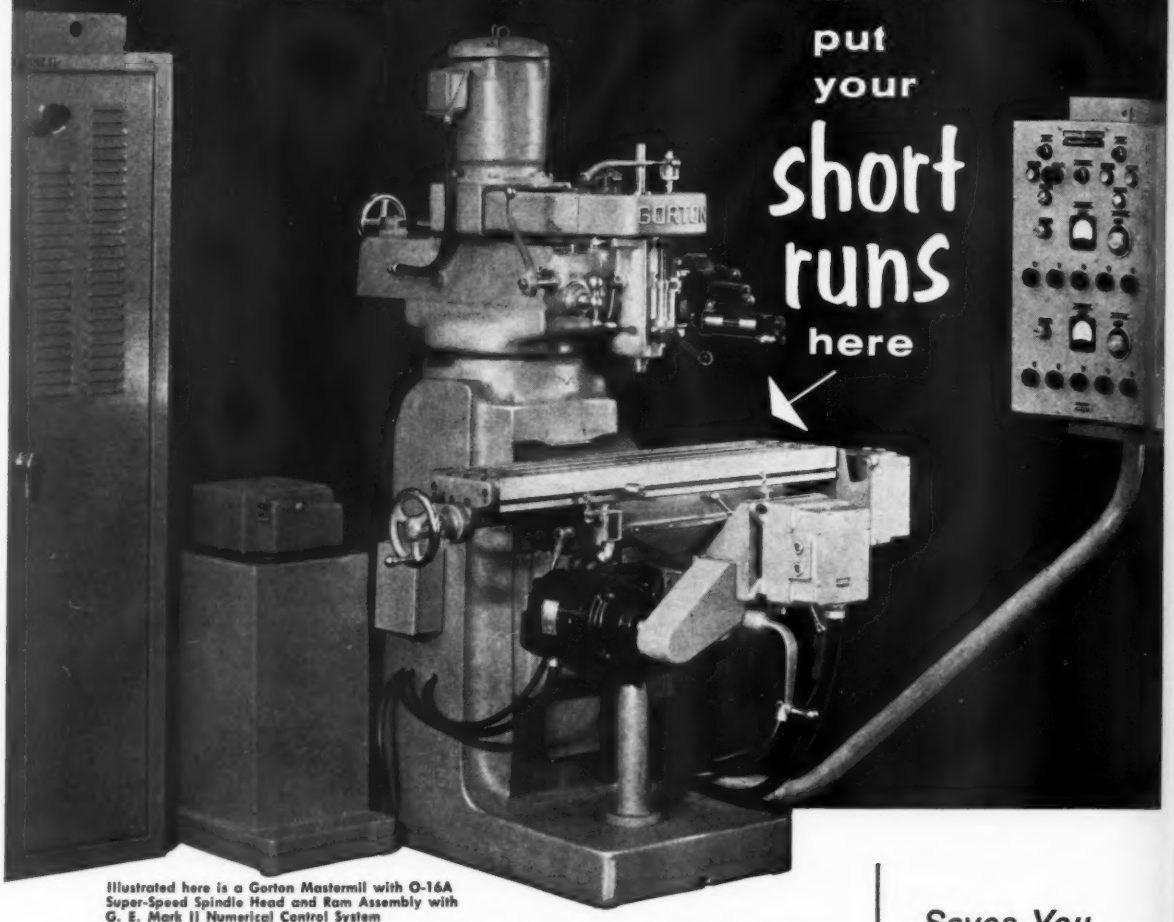
DENISON HydrOILics

HYDRAULIC PRESSES • PUMPS
MOTORS • CONTROLS

CIRCLE INFORM-A-GRAM KEY NO. 19

# FOR NUMERICAL CONTROL AT LOWEST COST




Illustrated here is a Gorton Mastermil with O-16A Super-Speed Spindle Head and Ram Assembly with G. E. Mark II Numerical Control System

## GORTON NUMERICAL CONTROL

### *is field tested and proved in use*

This is how Gorton Numerical Control saves you money on short runs:

- — eliminates elaborate and costly tools, dies, jigs and fixtures
- — wastes no time because operator does not "pace" the work
- — makes no mistakes because operator skill not required
- — extreme, repetitive accuracy is easy and automatic
- — change overs in set-ups can be made quickly
- — signals operator when tool changes are needed
- — guides cutter in close quarters without damage to work or cutter
- — making punched tape is simple typewriter operation

Punched tape . . . or magnetic tape control . . . is available to you on SIX standard Gorton machines and also on Gorton custom-designed machines. You'll be agreeably surprised when you learn the low cost of Gorton Numerical Control and how much more it gives you for your money. For full information write

*Saves You Money on —*

- face milling
- side milling
- end milling
- straight line cavity milling
- slotting
- drilling
- reaming and boring

Your letterhead inquiry will receive prompt attention.

GORTON

GEORGE **GORTON** MACHINE CO.

1206 RACINE STREET, RACINE WISCONSIN

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

CIRCLE INFORM-A-GRAM KEY NO. 20

# Talks of the Month

## What's Happening To Foreign Trade?*

*by H. Glenn Bixby*
**President**
**EX-CELL-O CORPORATION**
**Detroit, Michigan**

WHAT ABOUT TARIFFS? If we are to be realistic, we must recognize that we can't wall off the United States from the rest of the world.

We as a nation took a great step forward a quarter of a century ago when we adopted the Reciprocal Trade Agreements Act permitting the reduction of tariffs and other trade barriers.

We have been educated the hard way in learning that artificial trade walls are dangerous not only to us, but the entire free world.

We have made a fetish of free competition within our own country but have erred in assuming that competition is *only* good *inside America.*

* * * * *

Plainly, soft, vulnerable spots are developing in our export market for machine tools. There are many reasons why this is occurring. Chief among them, I would say, is our failure to shift with the world's everchanging tradewinds.

You are familiar with the postwar emergence of what is now called the European Common Market. Six countries — France, West Germany, Belgium, Luxembourg, Holland, and Italy — have overcome ethnic differences and political animosities to forge an economic union of vast potential.

. . . . The six market nations hope that time and effort will bring identical tariff and customs regulations . . . .

Exporters from non-member nations can look for two basic effects in their trade relations with the common market. On the one hand, they can look for an end to the multiplicity of tariff and customs regulations. This will enable them to ship to any part of the group under a uniform set of conditions. On the other hand, they can brace themselves for stiffer competition from member nations both within and outside the common market.

* * * * *

. . . . In addition to cutting their duties by 10%, they have reduced their import quota limitations by 20%. By the early 1970's, it is expected that all tariffs among common market nations will have been eliminated, all internal quota systems removed, and a common tariff on imports from outside the group established.

It behooves American business to make a careful assessment of its practices and philosophy in light of the movement in Europe toward economic togetherness. American business should keep in mind that:

1. The European market is expanding. Its population is 50% larger than our own. Its income will grow, along with its capacity to consume food and durable goods.

2. Europe will hurl increased competition within our own borders.

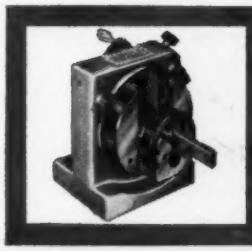
**. . . Continued on page 22**

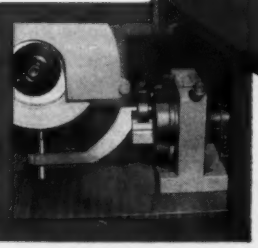
* Address given at Association of Cutting Tool Manufacturers.

DID YOU KNOW...
only $1,053.50
for the
HARIG-TML 6 x 12
SURFACE GRINDER

Now! Equip your tool-room with the most accurate, dependable surface grinder available. Out-performs many similar makes costing far more. Made by grinding specialists to assure you of superior results—time after time!

- Solid one piece construction of spindle housing and verticle slide.
- Elevating screw centrally mounted.
- Combination "V" and flat ways assure positive alignment.
- Angular rack and pinion face.
- Motorized spindle, dust collector and water unit available.





HARIG GRIND-ALL FIXTURE
For fast, accurate perforator grinding . . . milling, boring and inspection.

NEW! RADIUS DRESSER ARM
Quickly converts Harig's Grind-All Fixture into a precision Radius Dresser.

WRITE FOR LATEST BULLETIN

Harig Manufacturing Corp.

5761 W. HOWARD st.
CHICAGO 31. ILL.

CIRCLE INFORM-A-GRAM KEY NO. 21

**. . . Month's Talk from page 21**

This is illustrated by events of the last decade, when our imports of nonagricultural products soared from $750 million to $2½ billion.

3. European competition will be much livelier in other world markets. Europe already sells 2½ times as much abroad as we do.

4. American investment in Europe will have to be accelerated to cope with competitive forces. That this is recognized is shown by the fact that U.S. investments in Europe have climbed from $1.4 billion dollars to $4 billion since 1949.

The American ego also must adjust to the fact that European countries have made bold progress developing their industry and technology.

* * * * *

Complacency is becoming a stranger in Europe. The age-old power struggles have given way significantly to a new-found spirit of cooperation.

Another evidence of this was the action taken recently by 10 European countries to make their money more freely convertible with the dollar and other currencies .... France alone has devalued her franc by 17½% to make her more competitive.

Non-residents of these countries, including U.S. exporters, now may convert their holdings of the various currencies, provided the funds originate from commercial transactions, into American dollars or any other currency.

This is highly significant for this reason. It means that American exporters can sell dollar area products for British pound sterling, German marks, Swedish kroner, Dutch guilders and so on, and may freely convert these various currencies into American dollars at official rates.

What we must do, I think, is face up to the realities presented by the vibrant forces at work around the world ... we cannot remain inflexible in our policies and practices ... we cannot fight for the status quo while change is choking us ... we should scrap our outmoded adherence to protective tariffs and restrictive measures and invite the friendship rather than the hostility of nations. We should work honestly and sincerely to remove the distrust that is heaped so liberally upon us. We can't wall off the United States from the rest of the world. We have no monopoly on natural resources, or brains, (or) on technical wisdom.

* * * * *

## Industrial Forces In Science*

*by Samuel Lenher*
**Vice President and Director**
**E. I. DU PONT DE NEMOURS & COMPANY**
**Wilmington, Delaware**

PARTNERSHIP OF SCIENCE AND INDUSTRY is advancing human welfare . . . . Each supports and stimulates the achievements of the other . . . . Nearly every scientific discovery is translated by industry into technology and products valuable to mankind. Nearly every advance in technology suggests to science a further trail to be explored.

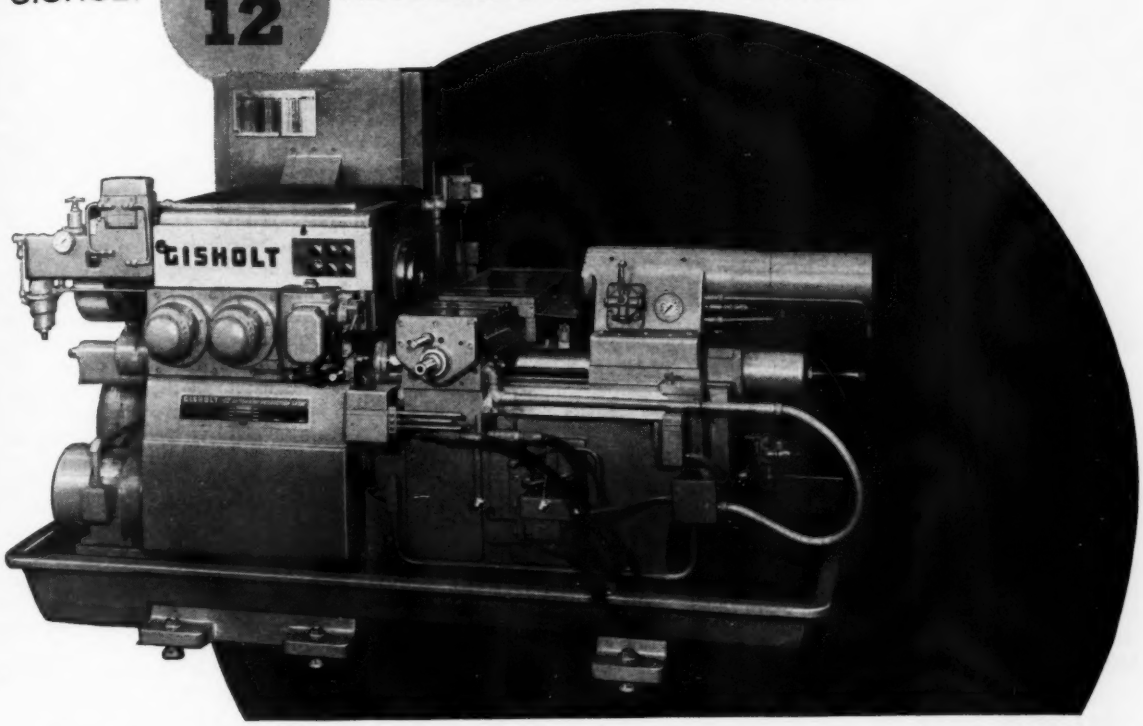
* * * * *

The role of industry in its partnership with science is practical and creative. The discovery of a new theory, or a new substance, in the laboratory may have profound scientific significance, but it is of little benefit to mankind unless it can be made to serve a useful purpose. Here industry steps in, with applied research and development, engineering, a great deal of patience,

* Given in the Contemporary Trends Course, University of Wisconsin.

Eclipse
CUTTING TOOLS
are
"Engineered for You!"
For almost half a century ECLIPSE has engineered and produced quality cutting tools. These years of leadership in the field guarantee the superiority and dependability of all ECLIPSE products. For longer tool life, finer finishes and better all-around performance, look to the symbol of perfection.
• H.S.S. CUTTERS • T.C.T. CUTTERS • CORE DRILLS
• BACK SPOTFACERS • MULTI-DIAMETER CUTTERS
• INSERTED BLADE CUTTERS • PORT CONTOUR CUTTERS
WRITE FOR CATALOG 51
ECLIPSE COUNTERBORE COMPANY
1600 BONNER AVE., DETROIT 20, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 22

GISHOLT NUMBER 12 AUTOMATIC CHUCKING LATHE




# Unequaled in its size range, in versatility, speed and low-cost production

Whether it's for continuous operation in mass production or a wide variety of parts in small lots, this machine is in a class by itself.

**Faster automatic cycle.** The No. 12 is a fully automatic chucking lathe, capable of performing all types of machining operations in rapid sequence. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it meets every requirement for stock removal, finish and minimum f.t.f. time.

**Complete range of accessories.** Front, rear, auxiliary and overhead slides can be applied; angular cuts are easily made; JETracer of single- or multiple-pass types can be used. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

**Greater power and rigidity.** Here, too, is the power (up to 40 h.p.) with rigidity to take full advantage of the newest tooling and the heaviest cuts without vibration.

**Boosts operator productivity.** It requires a minimum of operator skill and attention—allows him to handle additional machines.

With all its speed and ruggedness, the No. 12 has the extreme flexibility of motions to handle practically any machining job on parts up to 16½" in diameter. It delivers high production with consistent accuracy and less dependence than ever on operator skill.

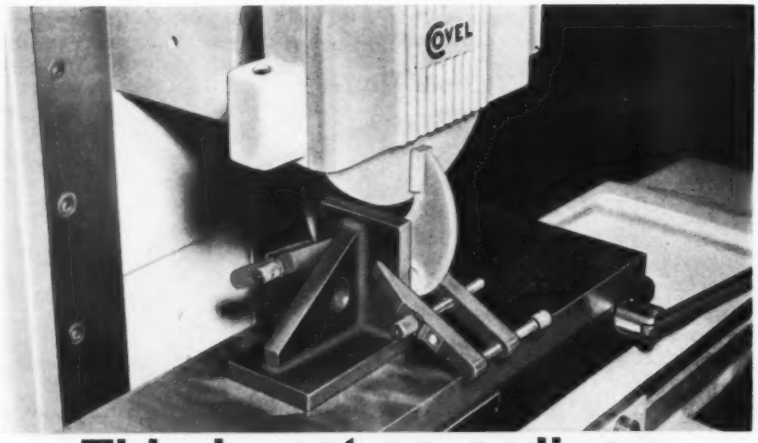
**Ask your Gisholt Representative or write for Bulletin 1213, just off the press.**

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

**Investigate Gisholt's Extended Payment and Leasing Plans**

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines
• *Factory-Rebuilt Machines with New Machine Guarantee*

CIRCLE INFORM-A-GRAM KEY NO. 23

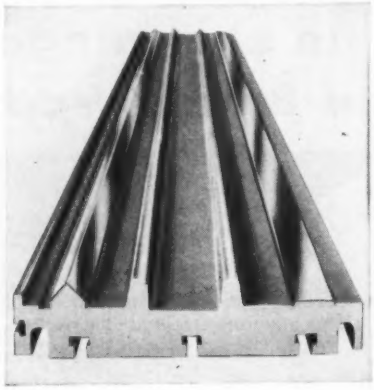



# This is not an ordinary surface grinder at work...

It's a Covel No. 10—built to do MICRO-PRECISION work on accurate snap gages like this. And it also does a top-notch grinding job on other tool room work such as form tools, jigs and dies—day after day and year after year to save you money. Covel pioneered with *hard chrome table ways* that keep this 6" x 18" machine in *top position* in the tool room grinder line-up far longer than grinders with ordinary ways. Covel-developed smooth *timing belt table drive*, hardened and ground lead screws and rigid vertical slide are among other outstanding features that add up to long-lived Covel MICRO-PRECISION performance.

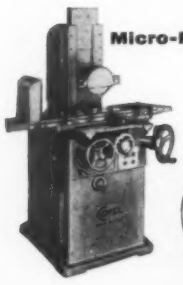
## *First* with hard chrome table ways...

A special plating process developed by Covel applies a hard chrome surface to hand-scraped Vee and flat table ways—insuring long-lived accuracy. Many Covel chrome plated ways have been in service for ten years and more without noticeable wear and without a sign of flaking.



### *Ruggedly built... hand or power feed models available*

The No. 10, like all Covel Precision Grinders, depends on a heavy, well-ribbed and proportioned base and wheel head standard as a foundation for built-in MICRO-PRECISION. Both hand and power feed models have all hand wheels, including elevating hand wheel, conveniently located *below* table level.



**Micro-Precision a Covel Tradition-Since 1874**

Send today for your copy of "The Covel Precision Story" and complete data on the Covel Surface Grinder that meets your needs — seven sizes from 6" x 12" to 16" x 36". Ask for Bulletin T-69.

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 24

and the expenditure of large sums of money without guarantee of recovery or reward. The objective is to find something useful to man that can be made commercially.

Businessmen are sometimes criticized for the emphasis they give to profit . . . . Until recently, at least, industrial leaders have been unable or unwilling to rationalize their role in society as essential contributors to welfare and progress. This reluctance has allowed the critics of our free enterprise system to foster a widespread misunderstanding of the function of profit as an incentive.

. . . whether the objective of industry is profit or human welfare is quite as unimportant as whether the chicken or the egg came first. To earn a profit, it is imperative for industry to provide a product or service which people desire at a price they are willing to pay . . . .

. . . no company can stay in business unless it can pay salaries high enough to satisfy competent management and supervision, and provide wages and working conditions sufficiently attractive to satisfy employees. This is just common sense, but . . . in addition, a company must have money for plants, machinery, and working capital . . . .

* * * * *

To manufacture and sell profitably, the businessman must provide a product which is more attractive to the customer than other products available. He tries to do this by developing a new manufacturing process so as to lower the price of an existing product, or by offering a new and better product. In either case, he turns to his old ally — science — because experience has demonstrated that the most effective tool to help him win the favor of customers is research.

Not all companies in industry can afford to carry on their own research. Some rely upon the technical discoveries of government and academic institutions. Others belong to trade associations which conduct research programs for the benefit of all the association members. Still others assign specific research problems to a university, or to private research organizations and institutes on a contract basis.

* * * * *

Some of you may wonder how any company can justify substantial spending for research, and particularly, basic research. The justification and the incentive can be expressed in one word — profits. Over the years, businessmen have found that research — both basic and applied — pays off.

# ...they all prefer PRODUCTO die sets

**DIE DESIGNERS**
appreciate the *unlimited* selection of die sets which accommodate any type of die design.

**DIE MAKERS**
like the amazing speed and ease of "take-apart and put-together" made possible by Qwik-Fit Guide Pins. (Safer handling, too.)

**PRESSROOM FOREMEN**
are convinced that Producto die sets maintain accuracy through long runs, *keep production up, downtime down.*

**CONTRACT SHOP OWNERS**
have found consistent die set accuracy, dependable delivery, and smooth performance justifies the confidence with which they specify Producto.

Quick, jam-free assembly and disassembly, lasting accuracy, unlimited selection of sizes and styles! Add to these advantages the benefits of immediate service in every industrial center through Producto's growing network of 46 branch assembly plants and distributor warehouses...and you realize why "They all prefer Producto". • **A WEALTH OF DIE SET INFORMATION** is available to you, free, in the comprehensive, easy-to-use Producto Catalog No. 11, and in regular issues of *Die Set Digest*. Write today for these valuable aids.

PRODUCTO

**THE PRODUCTO MACHINE COMPANY**
945 Housatonic Avenue, Bridgeport 1, Connecticut

# PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

# Mill Odd Shapes i

## ...with Barber-Colman Form-Relieved Cutters

We don't expect you to have a job exactly like this . . .

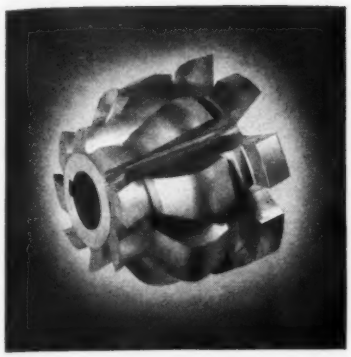
. . . but the manner in which cutter design was established may illustrate important benefits gained by submitting part prints to the Barber-Colman Tooling Service.

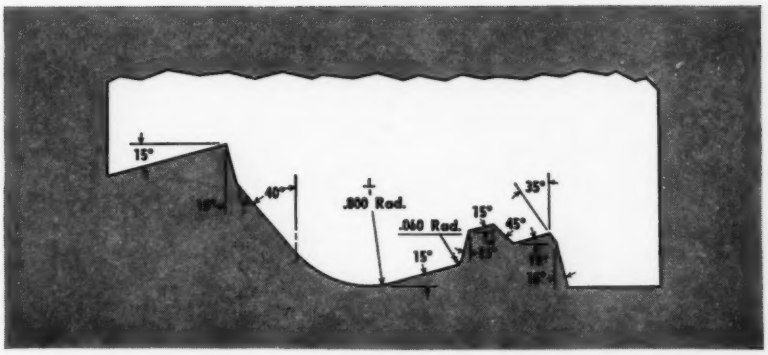
Whether you have irregular forms or a combination of straight surfaces to machine, a comprehensive engineering analysis will help you determine the one best cutter for increasing accuracy and combining operations economically.

### Electronic computer aids cutter design

This cutter requires a 10° helix and a 10° positive radial rake to produce the accuracy and smooth finish on the part. The helical flutes and radial rake make it necessary to calculate the cutter tooth form which will produce the desired part form. All plot points, formerly obtained manually, were determined rapidly and accurately on a Bendix computer. Only the points where a change in form

# in One Operation






occurs were obtained manually. Over 60 other points were determined quickly by the computer.

An electronic computer has the following advantages for you:

1. *Accurate cutters* — A direct solution is possible through the application of mathematical formulas which eliminate trial-and-error solutions. The great number of plot points which can be determined quickly and accurately assures exact duplication of complex shapes.
2. *Economical design* — You get the highest possible number of engineering man-hours devoted to actual development of the cutter because fewer hours are required to work out details.
3. *Faster service* — Speed of computation permits us to check a number of designs and still meet reasonable delivery schedules.
4. *Flexibility to change* — All variables other than form, such as helix angle, side clearance, number of teeth, cam, diameter, rake, etc., can be changed at any stage of engineering without rigidity at our end. There's no incentive to "save" a design should a different helix angle or diameter be desired.

Design of this cutter included a cutting clearance problem. If the part were set square with the cutter, a two-piece cutter with axial relief in both directions would be required. However, by tipping the part at 15°, a one-piece cutter can be used.

## Let us analyze your milling operations

The Barber-Colman Tooling Service is the most complete milling cutter facility available under one roof. Your part drawing can be evaluated in terms of every cutter style, for which we have complete manufacturing facilities: (1) standard or special cutters, or a combination of these in a gang; (2) high-speed steel or carbide-tipped; (3) eccentric-relieved or profile-type; and (4) ground or unground form.

There is a lot of wisdom in re-checking operations periodically in terms of new tooling and methods. This is not a difficult or costly thing to do. Yet it may reveal golden opportunities to tighten up tolerances, improve surface finish, or reduce manufacturing costs. It may be on a time-consuming planer job, a series of flat-surface milling operations, complex form milling, or even new pieceparts.

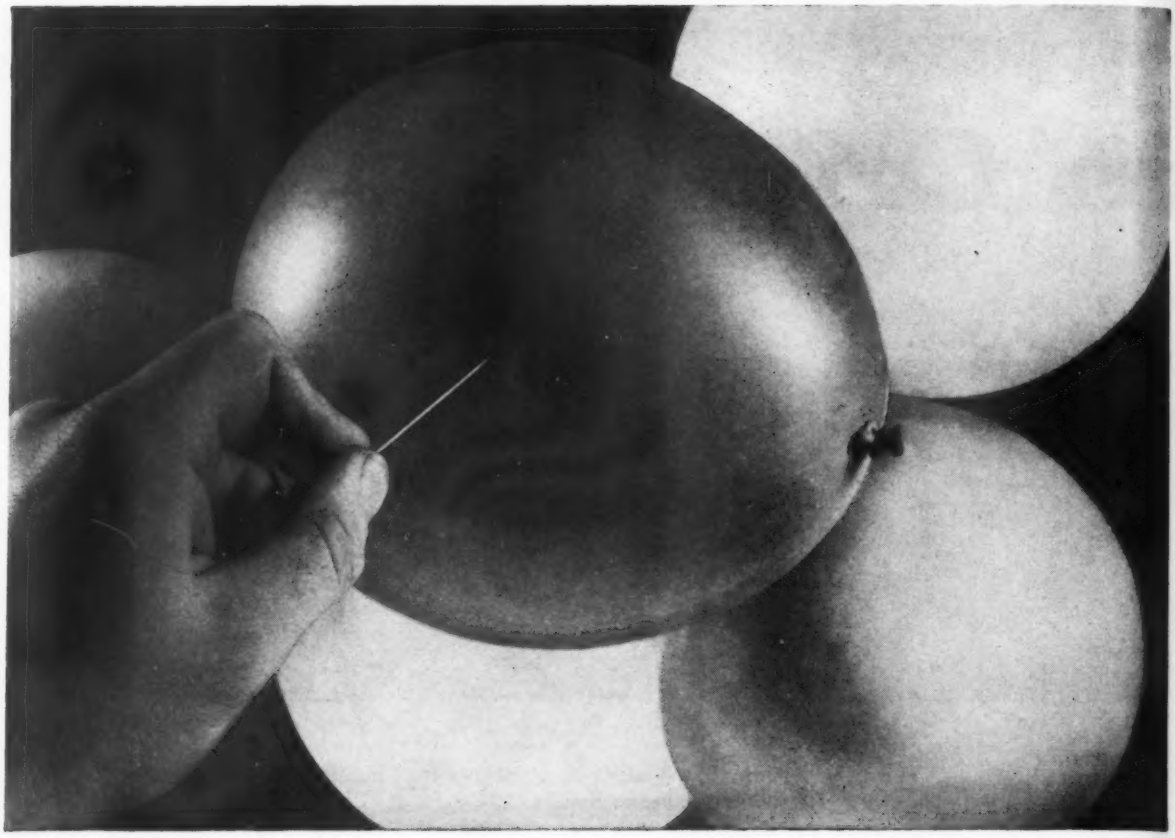
How about putting the Barber-Colman Tooling Service to the test? It will cost nothing to submit part prints or discuss your jobs personally with a Tooling Specialist. We're ready any time you are. Call your nearest Barber-Colman field office or the factory — TR 7-5741.

**Barber-Colman Company**

BARBER COLMAN ®

67 Loomis Street, Rockford, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 27



*Machine Tool Buyers:*

## Beware the fallacy of projecting today's labor rates!

Almost without exception, machine tool replacement formulas employ an erroneous factor in computing savings — they are based on *today's* labor rates.

It seems basically sound to suggest, in the case of a contemplated investment in equipment, that a projection be made as to the estimated period over which the equipment is to be used.

Assuming this to be ten years, it is a fairly simple matter to project the *average* wage rate over the next ten years by using the historical increase for the past several years. This increase is known to be from 5 to 6% per year.

Using 5%, we then have a simple computation to determine the average projected wage rate which should be used in computing savings in a replacement formula.

Assuming a current wage rate of $2.50 per hour, this becomes $4.07 per hour at the end of ten years, or an increase of 62.8% over today's labor rate.

This percentage increase could reasonably be applied also to other factors in the computation of savings, such as indirect labor, fringe benefits, maintenance, etc.

In contemplating the purchase of a piece of equipment which will last for a number of years, it is fallacious, therefore, to compute savings in terms of today's costs only.

Does Jones & Lamson offer a positive approach; a realistic, workable formula that is free from fallacies such as this? *Yes!*

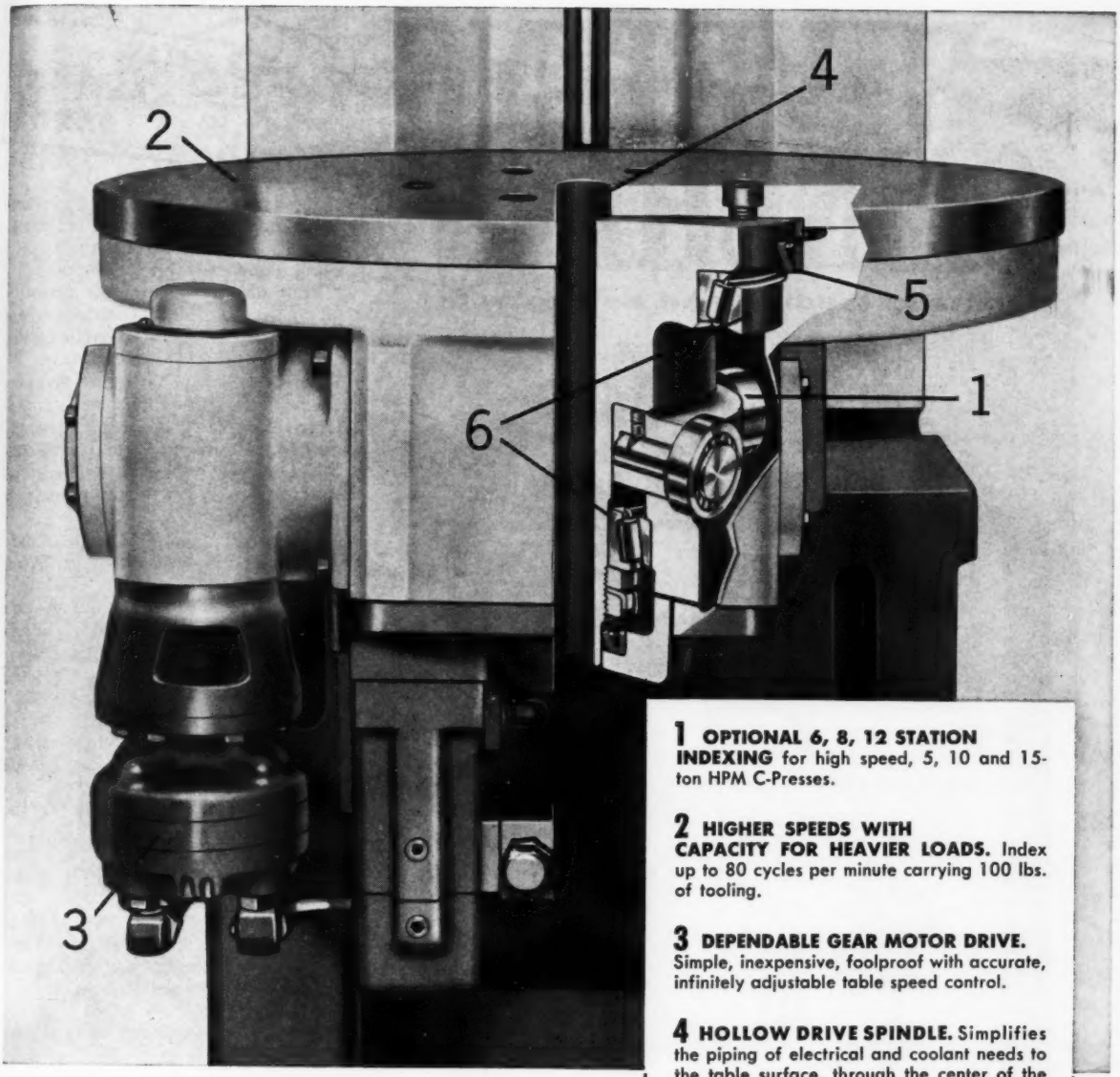
Write today for complete information.

**the man who needs**
**a new machine tool**
**is already paying for it**

**JONES & LAMSON** Machine Company, 519 Clinton St., Springfield, Vt.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE INFORM-A-GRAM KEY NO. 28




**1 OPTIONAL 6, 8, 12 STATION INDEXING** for high speed, 5, 10 and 15-ton HPM C-Presses.

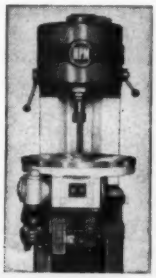
**2 HIGHER SPEEDS WITH CAPACITY FOR HEAVIER LOADS.** Index up to 80 cycles per minute carrying 100 lbs. of tooling.

**3 DEPENDABLE GEAR MOTOR DRIVE.** Simple, inexpensive, foolproof with accurate, infinitely adjustable table speed control.

**4 HOLLOW DRIVE SPINDLE.** Simplifies the piping of electrical and coolant needs to the table surface, through the center of the table from underneath.

**5 SEALED DRIVE UNIT.** Index table drive unit is completely sealed from coolants or abrasives used on the table surface.

**6 ANTI-FRICTION BEARINGS USED THROUGHOUT.** Smooth, long-lasting trouble-free service is assured.



**7 ACCURACY.** Each index of the table locks in work position with an accuracy of .002".

**8 SIMPLIFIED MAINTENANCE. COMPLETELY J.I.C.** Standard foot-mounted motors, exposed pump, hydraulic motor and valving are easily accessible.

# Eight production advantages standard at no extra cost

Here it is . . . the new H-P-M index table press combination, for production men charged with getting more return for their invested dollar. It's fast, accurate and completely J.I.C. with many other worthwhile production advantages. Check the outstanding features at the right . . . our offering for the best buy on the market.

*Write for new catalog, today. Plan for more profits by planning with H-P-Ms.*

**THE HYDRAULIC PRESS MFG. COMPANY**

A Division of Koehring Co.
Mount Gilead, Ohio, U.S.A.

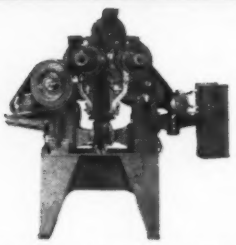
H902

CIRCLE INFORM-A-GRAM KEY NO. 29

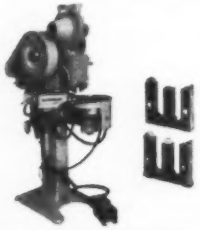
*Speed up* **RIVETING** and **CLINCHING**

**Automatic feeding and setting with**

# T-J



**RIVETS 4 AT A TIME!** Special quadruple riveting unit, incorporating two Model "RR" Twin Rivitors, mounted on a special welded steel base. Equipped with air-operated hold down mechanism and a safety air trip arrangement. Tooled for riveting left hand and right hand automotive muffler bracket assemblies.



**SPECIAL TWIN RIVITOR!** Tooled for 6 station indexing fixture, incorporating automatic clamping and ejecting mechanisms, for riveting laminated armature assemblies.

**T-J CLINCHOR** adapted to a wide range of clinch nut setting problems. Gravity Feed model shown here.

You'll realize *faster assembly . . . reduced labor costs* immediately, when you use T-J Rivitors and Clinchors for your production line. These performance-proved machines are designed to do a wide range of assembly jobs for aircraft, automotive, farm machinery—riveting jobs of *all* kinds.

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞" long. Throat depths 8" to 36".

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity Feed models, throat depths 8" to 36".

Send today for these helpful references: Rivitor bulletins 646 and 555 . . . Clinchor bulletin 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

CIRCLE INFORM-A-GRAM KEY NO. 30

**James W. Lewis** joins Swanson-Erie Corp., as manager of sales engineering for special automatic processing and assembling machines.

Four district supervisors recently advanced to district managers by Wesson Co. include: **Sy Dworecki**, Chicago; **James J. Smith, Jr.**, E. Paterson, N. J.; **Gerald Bogner**, Cleveland; and **Anthony Rogers**, Detroit. New sales and service engineers are **John Taylor**, southeast Michigan; **Robert L. Wilson**, Dayton-Columbus, Ohio area; and **William Germani**, Detroit.

New product sales manager of carbide tools for the Abrasives Div'n, Elgin National Watch Co., is **Robert DeDobbelaere.** The company also appointed **Jack Wiziarde** district sales manager of Ohio, upper New York State, western Pennsylvania, West Virginia, Virginia, and the Carolinas.

**Robert J. Ogden** recently took over as manager of screw machine stock sales for Aluminum Co. of America.

L & J Press Corp. announces the promotion of **R. David Mathias** to vice president in charge of sales and the appointment of **Robert H. Kemp** as chief engineer.

Promotion of **H. J. Siekmann** to manager of market development and research has been announced by the Metallurgical Products Dept. of General Electric.

**Dwight W. Kaufmann** is now serving as manager of tool steel sales for the Crucible Steel Co. of America. He succeeds **A. H. Lewis** who was named assistant to the works manager of the company's Sanderson-Halcomb plant in Syracuse, N. Y.

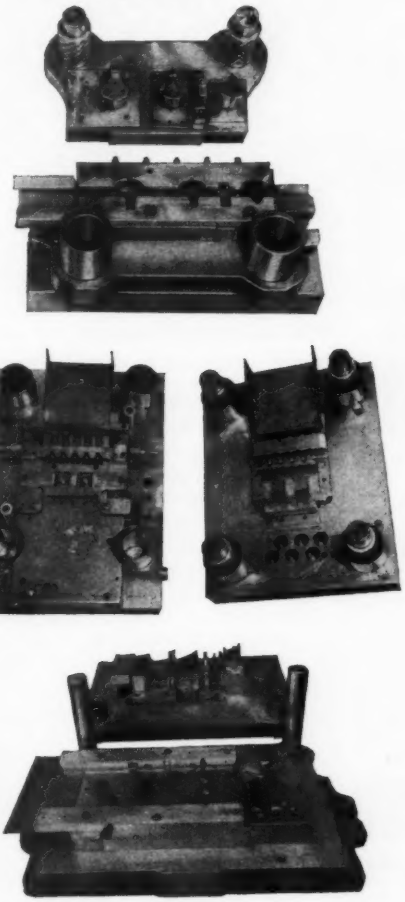
New northern California representative for Mead Specialties is **Lloyd Cowdin.**

**William P. Henkel** recently was named Dayton district manager of Latrobe Steel Co., following five years as a Dayton sales staff member.

The Sinclair-Collins Valve Co. and Valvair Corp., divisions of International Basic Economy Corp., have appointed **Duane R. Branaka** general sales manager. He's responsible for supervision of both marketing activities for the two divisions.

Taking over as assistant sales manager for Whitman & Barnes, is **Frederick J. Keller.**

**Produced by LATROBE for long-run dies...**



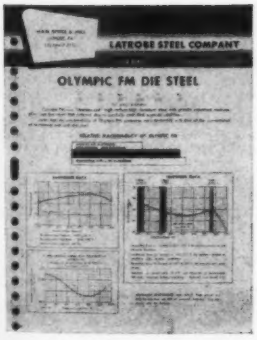
Metalmasters

Fully-Uniform . . .
Free-Machining
DESEGATIZED®
**OLYMPIC FM**
**High Alloy Die Steel**

When your die production calls for long-run service . . . and you need a die steel that yields a superior machine finish without tearing—one that has excellent non-deforming characteristics in heat treatment . . . that's the time to use Latrobe's OLYMPIC FM.

OLYMPIC FM is an air hardening 12% chromium (D-2 type) die steel made to exacting standards by Latrobe Metalmasters . . . guaranteed to be fully-uniform in the distribution of wear-resisting carbide particles and alloy sulphides for better machinability . . . a result of Latrobe's exclusive DESEGATIZED® process of manufacture!

*There's a wide range of Olympic FM sizes stocked at branch warehouses near you—Call today!*




*Or send for Olympic FM Data Sheet today!*

**LATROBE STEEL COMPANY**

MAIN OFFICE and PLANT: **LATROBE, PENNSYLVANIA**

**BRANCH OFFICES and WAREHOUSES:**

BOSTON • BUFFALO • CHICAGO • CLEVELAND • DAYTON
DETROIT • HARTFORD • LOS ANGELES • MILWAUKEE
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SAN LEANDRO • TOLEDO

CIRCLE INFORM-A-GRAM KEY NO. 31

# save tooling dollars

## with this versatile, quick set-up

DUMORE®

## AUTOMATIC "DRILL-N-TAP" UNIT

**Only $825 ***

Complete tool, ready to operate —includes reversing motor, electric tap control, pulleys, chuck.

**Do all these operations—*and more***

**TAP • DRILL • REAM • CHAMFER**
**SPOT-FACE • CENTER • DEBURR**

**NOSE MOUNTING BRACKET**

**Your Key** to all-purpose machining—**anywhere.** It permits fast, easy mounting in any position, angle or direction in single set-ups, or multiple operations in sequence.

**You can save hundreds of dollars in first cost alone with these DUMORE AUTOMATIC DRILL UNITS**

**SERIES 24 DRILL UNIT**
Fully automatic with all controls built-in for short or long runs and frequent changeovers. From $613*
**SERIES 26 DRILL UNIT**
Same as Series 24 with just basic controls built-in for long, uninterrupted runs. From $505.50*
**SERIES 20**
Built-in adjustable controls—automatically selects proper speeds/feeds. No. 80 to 5/32" drill capacity. From $217.50*

*FOB Racine

### Plug it in and it's ready to go

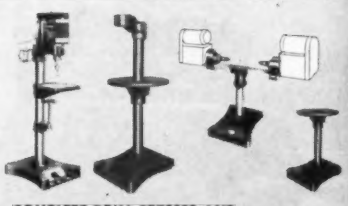
—Any unskilled laborer can learn to operate it in minutes. Once set, it's always set — minimizes scrap loss, drill breakage and eliminates operator fatigue slowdowns. Changes easily, quickly from job to job, operation to operation, for long or short runs. Precision engineering, famous Dumore quality workmanship and separate, isolated hydraulic and pneumatic systems provide trouble-free service over millions of cycles. Less than one cubic inch of air required . . . a cost-cutting feature.

### The Dumore Series 28 "Drill-N-Tap" Unit

can be a drilling or tapping machine with just the flip of a selection switch. Tap fits into chuck, no extra attachments required. Reversing motor controls tap, eliminates troublesome clutches. Adjustable, positive spindle speeds from 265 to 4900 rpm. Can be set up for operation in 5 minutes—on drill press or special machine, with simple nose bracket. *For more details, send coupon.*

**BUILDING-BLOCK ACCESSORIES FOR AUTOMATIC PRODUCTION**

**MULTIPLE SPINDLE ATTACHMENT** fits units 28, 24, 26. For simultaneous drilling or tapping of 2, 3 or 4 holes. Quickly adjustable center distances.



**COMPLETE DRILL PRESSES AND TABLE FIXTURES**
Includes Circular and Rectangular Fixture Presses, Cross Arm Bar Assemblies, Circular Production Tables, Variety of Brackets, Control Components and other units to provide complete parts needed for building your own single or multi-purpose drilling or tapping machines for lower cost production.

**AND THESE HANDY, USEFUL TOOLS**

**DRILL GRINDER,** resharpens and precision points drills up to ¼".

**MICRO-DRILL** for drilling holes as small as .0001" diameter, without skilled operators.

**HI-SPEED DRILL PRESS,** hand operated, bench type, 0-⅛" capacity. And, **DRILL SPEEDER,** right, fits standard drill press, 17,000 rpm. 0-⅛" capacity.

*Sold and Serviced Thru Leading Industrial Distributors Everywhere*

You Can Do More with DUMORE

**ALL PURPOSE PRECISION METALWORKING TOOLS**

**VERSA-MIL • DRILL-N-TAP UNITS DRILLING UNITS • DRILL HEADS MICRO-DRILLS • DRILL GRINDERS PRECISION GRINDERS • HAND GRINDERS • FLEX-SHAFT TOOLS • QUILLS AND ACCESSORIES**

**THE DUMORE COMPANY** • 1304 Seventeenth St. • Racine, Wisconsin

*Clip to your letterhead*

Send me Drill Unit details

Your Name_____

CIRCLE INFORM-A-GRAM KEY NO. 32

## MEN YOU SHOULD KNOW

Pratt & Whitney Co. recently named three executives to new posts. **Jacob J. Jaeger,** formerly vice president in charge of engineers, is now executive vice president; **Henry J. Fredericks,** former treasurer-controller, is a new vice president; and **Edward J. Shages** moved up from vice president and manager of the cutting tool and gage division to vice president in charge of manufacturing for all operations.

**Theodore C. Weill** now serves as general manager of Lemmon & Snoap.

As manager of the operations at A-S-R Products Corp.'s razor and blade plant in Staunton, Va., **Wayne M. Biklen** is responsible for the manufacturing, engineering, quality control, and materials functions within the plant.

New plant managers at the Plymouth and Dodge assembly plants of Chrysler Corp. are **William C. Cawthon, Joseph B. Neal, Harry R. Bentley,** and **Vincent P. Masi.** Cawthon serves at the Plymouth final assembly and body plants, succeeding **C. J. Demerick,** who is now president of Chrysler's Amplex Division. Neal takes over for Cawthon at Dodge, and the Mound Road Engine plant is managed by Bentley and the Trenton Engine plant by Masi.

**Richard E. Krafve** has been elected to the newly created position of group vice president - commercial for Raytheon Mfg. Co., and is responsible for activities of divisions that manufacture and distribute commercial and industrial products. Promotion of **George Loomis** to manager of the Receiving Tube Division was also made known.

Appointment of **Allan Ray Putnam** as managing director of the American Society for Metals has been announced by the organization.

Parker-Kalon Division, General American Transportation Corp., has announced these appointments: **Louis Lovisek,** former chief engineer, takes over as manufacturing manager in charge of manufacturing, planning, and engineering. **Harold Rosenberg** moves up to plant manager, and **Ed Holmes** to planning manager. New assistant general manager is **Herb Rodaman.**

New chief engineer of Wheelabrator Corp. is **Harold F. Schulte.**

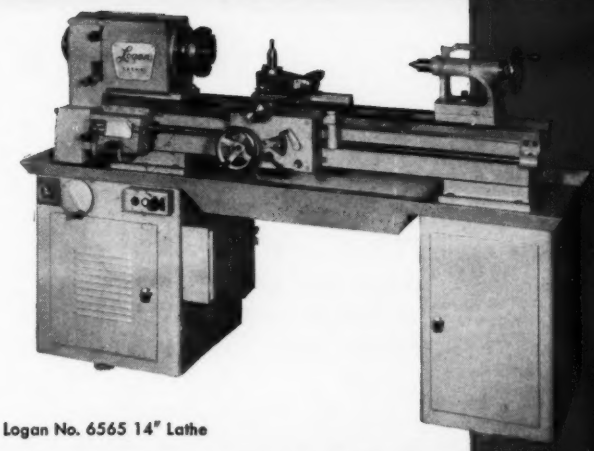
**Roy K. Kraebber,** former manufacturing manager at the Lynch Road Gear and Axel plant of Chrysler Corp., was recently appointed plant manager of the company's Amplex Division. He's responsible for all manufacturing operations at the Amplex plants in Detroit and Trenton, Mich. Promotions at the Dodge Assembly Plant include **E. C. Shawe,** production manager; **B. L. Hengesbaugh,** quality control manager; and **R. E. Castle,** supervisor of quality engineering.

**Richard C. Bryan** is now manager of manufacturing and **A. C. Schliewen,** works manager, of The White Motor Co.

**Jack Slean** has been named president of Heinrich Tool & Die Corp., following the retirement of **Rudolph Heindrich.** Slean also continues as general manager. General plant superintendent **Julius A. Schensky** is now vice president of manufacturing; **Harold O. Love,** vice president and general counsel; and **Perry G. Abbott,** secretary-treasurer.


its specifications add up to high production capacity

Logan 14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-capacity features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
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- 9" swing over saddle cross slide
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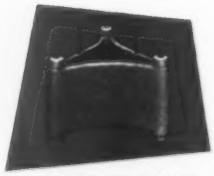
**LOGAN ENGINEERING CO.** Dept. M-659 4901 Lawrence Avenue, Chicago 30, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 33

7 PLA-CHEK GAGES stand guard over Ford precision and accuracy in this Layout and Inspection room at Ford Motor Company's Dearborn engine plant in Dearborn, Michigan
1
2
3
4
5
6
7

# 7 of 200 Reasons Why Inspections are *Faster at Fords!*



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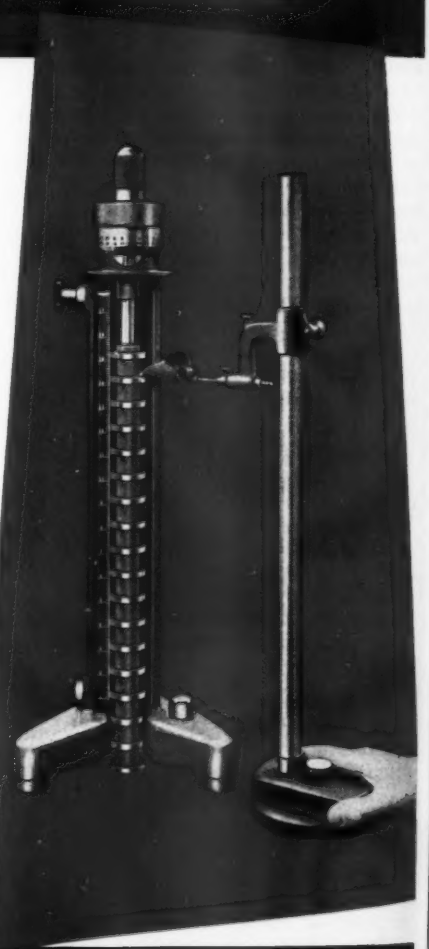

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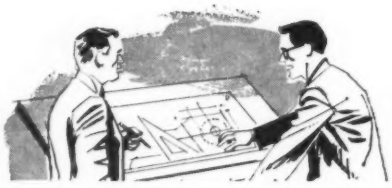
# How to solve next-to-impossible nut running jobs . . . fast



IN INDUSTRY—SPEEDING THE PACE,

the Gardner-Denver specialist is an integral part of the team. He works side by side with engineers and designers, helping to solve their problems, for at Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

Close-quarter or odd-angle nut running problems? Solve these and other tough ones quickly and easily with a Gardner-Denver ratchet wrench. Typical example is above assembly of rear spring shackle nut on auto frame.

Flat driving-end of the wrench fits into spaces too small for other power tools—places usually inaccessible to anything but hand and open-end ratchets.

This wrench is available with a variety of attachments for a wide range of job applications: extra thin, extended, angular, open-end, and many socket styles. Either tighten or remove nuts by simply turning the tool over.

Gardner-Denver ratchet wrenches are available in five motor sizes to provide wide ranges of speeds and torques. Write for Bulletin 17.

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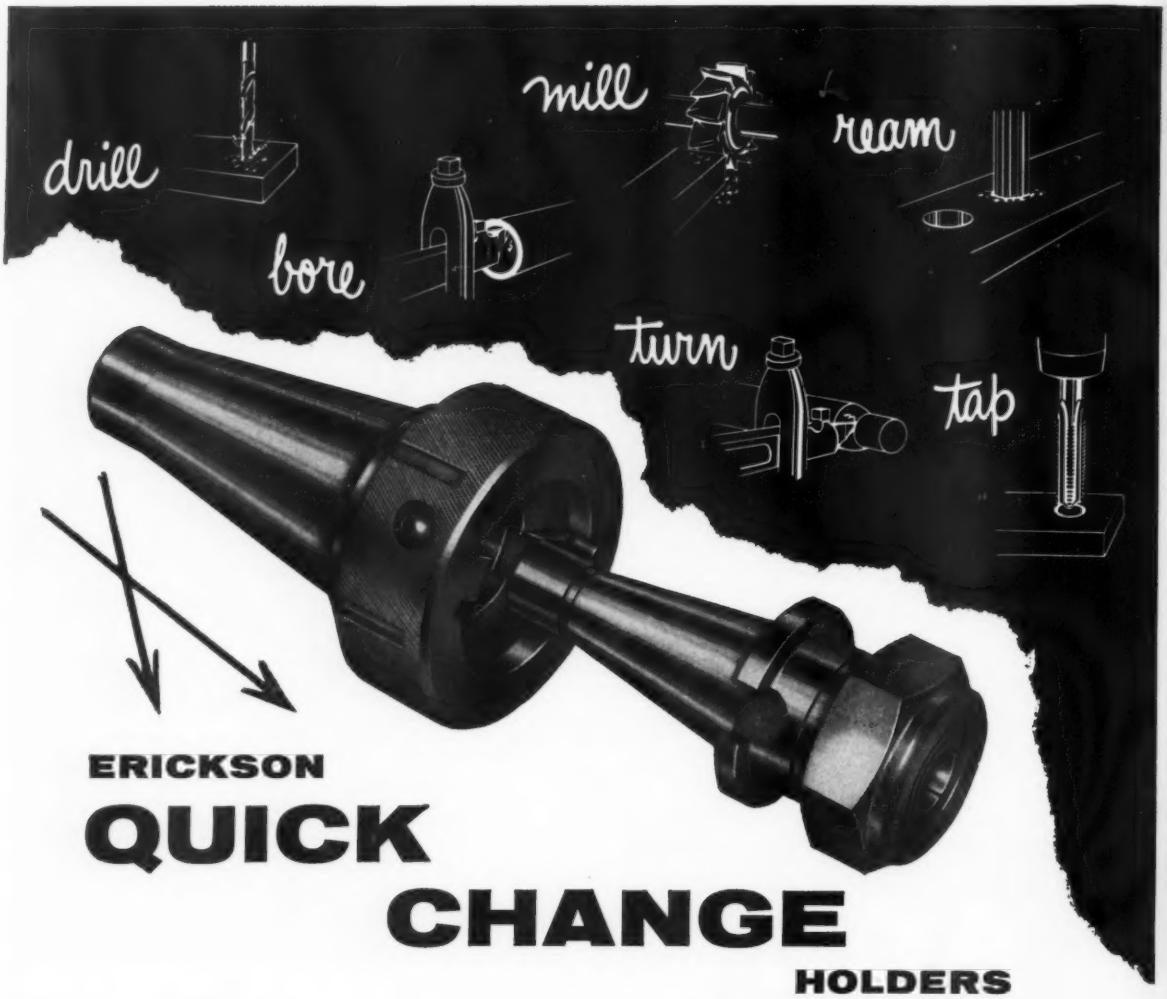


**ERICKSON**

# QUICK CHANGE HOLDERS

## ...for use with your standard MMS tapered tools ...designed for presetting of tools

Now you can use your present standard MMS tapered tools with the *new* Erickson Quick Change Holders. That means you get the double production advantage of Erickson's *high precision coupled with the rapid change feature.*

Several different models comprise the line: Morse taper holders for boring mills and radial drills, milling machine holders that fit standard spindle tapers, turret lathe holders that increase turret lathe tool-holding capacity, straight shank holders with #30 or #40 MMS socket. These holders take Erickson Collet Chuck milling machine adapters in both regular and heavy duty types, end mill adapters, shell and face mill adapters, Morse taper adapters, boring head adapters, and chuck adapters for Jacobs internal taper.

AA-7455

**A call or card will bring the Erickson representative on the double. Meantime write for your copy of Catalog G "Erickson Quick Change Holders."**

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COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES

CIRCLE INFORM-A-GRAM KEY NO. 38

# FINALLY, AN INTERNATIONAL INCH!

IN A FEW DAYS our standard U. S. inch will cease to be equal to 25.4000508 millimeters. Come midnight, June 30, 1959, our official inch will be cured of its unwieldly hangover of 0.0000508 mm and will join up with the official inches of Canada, the United Kingdom, Australia, South Africa, and New Zealand by becoming exactly equal to 25.4 millimeters, and in this case "exactly equal" means just that—plus or minus nothing.

At the same time the United Kingdom inch will "grow" by 0.000044 mm from its traditional 25.399956 mm to the new 25.4 mm standard. The Canadian inch will retain its status quo (since 1951) of 25.4 mm.

This international agreement on the new metric value for the inch has been reached by the directors of the standards laboratories of the several countries. It is based on a new value for the International Yard of 0.9144 meters (914.4 mm) concurrently established by the same officials and to become official on July 1, 1959.

So we have it; one yard equals 36 inches or 914.4 mm, and one inch equals 25.4 mm without any long, drawn out decimals.

By no means does this mean that you are to run—not walk—to the nearest trash can with your treasured gage blocks. The transition will be very painless, if noticeable at all. It boils down to the fact that the new inch that you will use for calibration purposes will be two millionths of an inch shorter than your present one.

Today, however, two millionths of an inch is a very tangible and measurable entity, and is a respectable fraction of some of the total tolerances that are assigned to workpiece dimensions in the more sophisticated products which are becoming almost commonplace.

It goes without saying that the life of the first man to venture space flight will depend upon the quality of his propellant and guidance hardware, and that quality will be attained by a control of many component dimensions in the order of millionths of an inch. That would be no time to have to pose the question of which inch? One can't say that the new International Inch may well be more vital to future space travellers than to you because, after all, you are going to be producing their vehicles.

A most interesting aspect of the new inch was cited last year by Albert M. Dexter, Jr., Pratt & Whitney's Director of Metrology in a discussion of the new inch proposal. He said,

"Some opposition is expected, primarily from the U. S. Coast and Geodetic Survey because the entire U. S. is mapped using the present inch, and although the difference is slight per inch, over distances of hundreds of miles, thousands of bench marks and reference points would be in error by as much as 4 feet.

"On the other hand, it is desirable to change the U. S. inch for two reasons: (1) it would bring us into agreement with the other English speaking countries of the world after universal adoption; and (2) it would make exact the conversion of inches to centimeters on machine tools and measuring equipment by merely using gears in the ratio of 254 teeth to 100 teeth or combinations to give this ratio.

"It is likely, or at least possible, that we will have in the United States two different inches where we have only one today. The present inch might be called the Geodetic Inch, and the proposed one might be called the International Inch. This would be somewhat analogous to our Nautical and Statute Miles which are both in use today."

Mr. Dexter's comments on the facilitated conversion of inches to centimeters strikes a little closer home for you in metalworking than does his reference to real estate and navigation. How would you like to work out a gear tooth ratio of 2.54000508 to 1, as compared to a clean and simple 2.54 to 1?

For you to whom the choice between the new International inch and the older unit represents a significant difference, gage block manufacturers and the Bureau of Standards will be prepared to recalibrate your gage blocks.

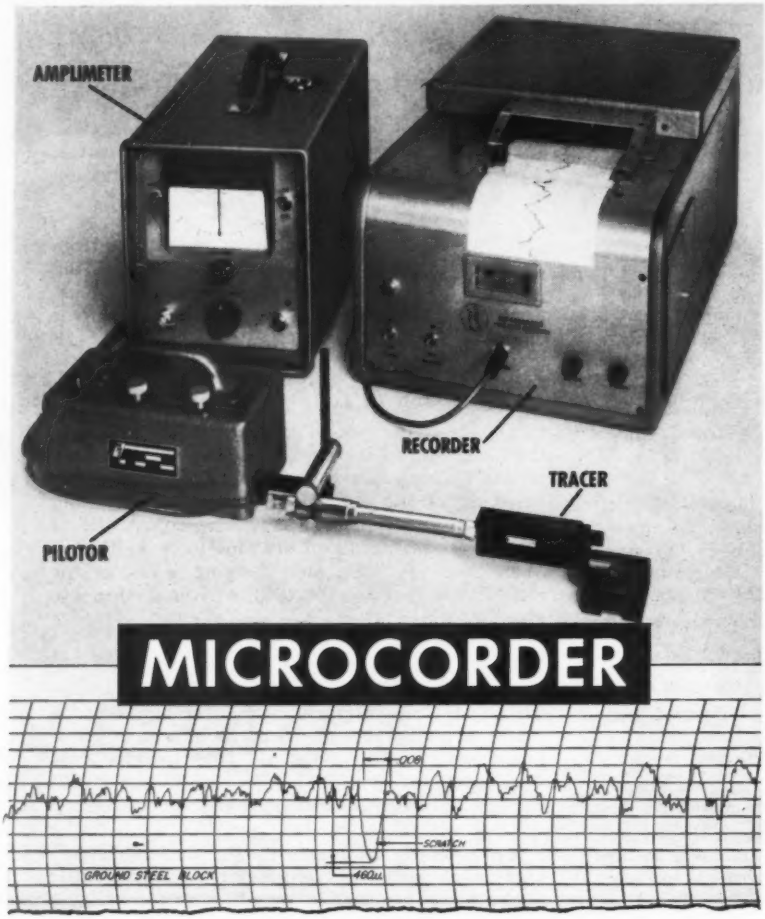
Also, your present calibrated blocks can be reconciled with the International inch and used simply by applying the necessary correction value to any dimensional build-up of your reference blocks.

Thus, during this transition period, your production need not suffer any discontinuance of accuracy or dimensional control.

E. Willard Pennington

Editor

# *Presenting* A NEW INSTRUMENT FOR SURFACE INSPECTION AND CONTROL




THE MICROCORDER draws a magnified roughness profile of ID, OD and flat surfaces, for any length of trace up to 2¾". From its 4"-wide chart you can readily measure the *peak-to-peak spacing* and *peak-to-valley height* of roughness irregularities — and the *width* and *depth* of pits, scratches, chatter marks and surface porosity. A wide range of magnifications is provided.

This instrument is as simple to use as a TV set, and is equally at home in shop, lab and inspection department. It is used on metals, paper, plastics, ceramics and many other materials; and it is made and guaranteed by the *pioneers* in surface-measurement instrumentation.

Detailed specifications are given in Bulletin LT138. May we send you a copy? Write —

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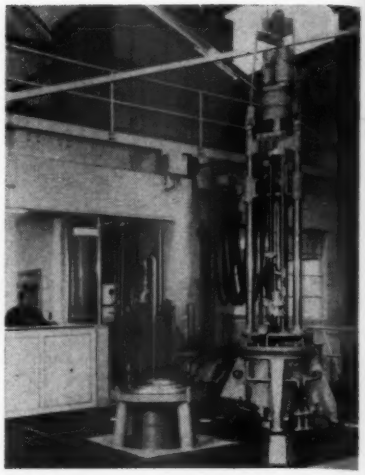


## LATROBE'S VAC-ARC

An outstanding new development in metallurgy in recent years has been the rapid introduction and growth of vacuum melting.

The Latrobe Steel Company is applying the new technique to steel production, to make stronger, more heat resistant, more ductile, and more perfect alloys in the field of tool steels, bearing steels and aircraft steels.

Long a producer of electric furnace tool steels, Latrobe is employing the vacuum consumable electrode melting process in their new Vac-Arc furnace installation. The process consists of arc remelting of the desired alloy under vacuum.

The accompanying schematic of the installation discloses that an ingot or "electrode" of electric furnace steel is introduced by overhead crane into the Lectromelt Crucible. The furnace is sealed, a high degree of vacuum is "pumped," and a low voltage, high-amperage arc is struck between the lower end of the ingot and the bottom of the crucible. As the electrode melts, dissolved gases are drawn off under vacuum and undesirable inclusions are substantially eliminated. The molten metal solidifies from bottom to top resulting in a highly improved ingot structure.

In other words, the initial electrode ingot melts and the rising pool of molten metal in the water-jacketed crucible becomes a new ingot of superior metallurgy.

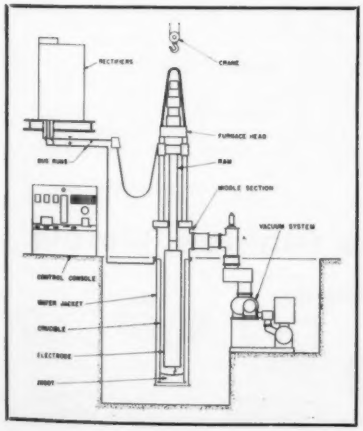
The Latrobe furnace is of 20" diameter, capable of producing a maximum ingot of 8500 lbs. or an annual output of 6,000,000 lbs. It was designed, built, installed and placed in operation by Lectromelt Division of McGraw-Edison Company in coop-

eration with Latrobe technical and engineering personnel. First of several to be installed, the furnace has been yielding a variety of grade melts since early March.

A compact power supply and a unique electrode drive control assures automatic split-second correction of any variables during the melting cycle. The sensitive control system guarantees uniformity of metallurgical properties throughout the ingot. All operations are conducted from the adjacent control console.

The field of application for vacuum arc melted materials is widening steadily, and will eventually include all grades used for parts requiring a high strength/weight ratio or special magnetic properties. Many of the materials presently being vacuum arc melted go into high stress rotating parts where failure would be dangerous and/or expensive. Stainless steels for the nuclear power field, bearing steels for heavy duty applications, low alloy steels for aircraft frames, tool and die steels, iron and nickel base magnetic materials and some electrical steels are now being refined in this way. Most high-temperature materials, including the super-alloys, have such critical applications that users' specifications for these materials have already been revised upwards, making vacuum arc melting essential.

Some of the newer complex aircraft engine alloys, hardened by titanium, aluminum and zirconium additions can only be made clean enough for the critical properties required by vacuum remelting. Also, some of the hard, high strength alloys like Dynaflex must be vacuum remelted to make them ductile enough for severe service. Any slight non-metallic inclusion, or clump of carbides, will cause failure. Proper vacuum remelting is essential for developing the desired properties.

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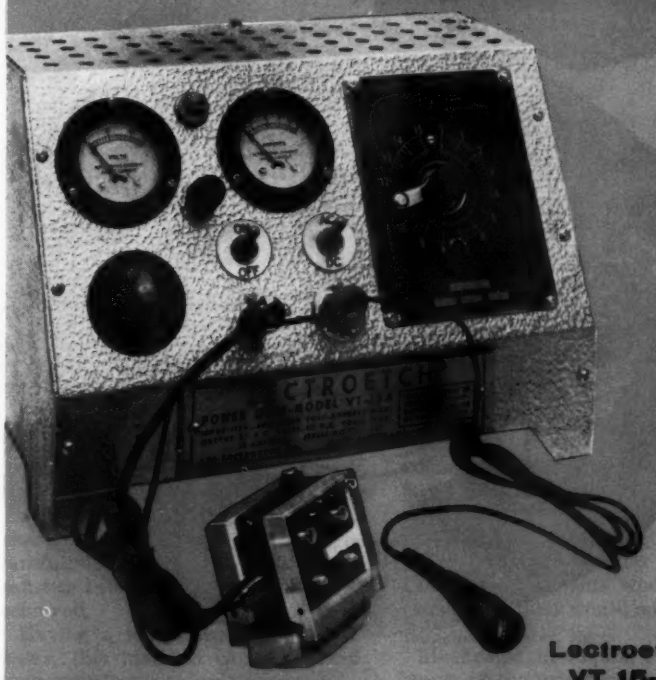

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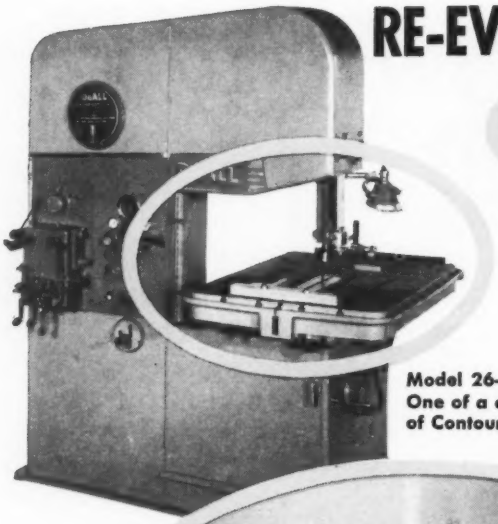
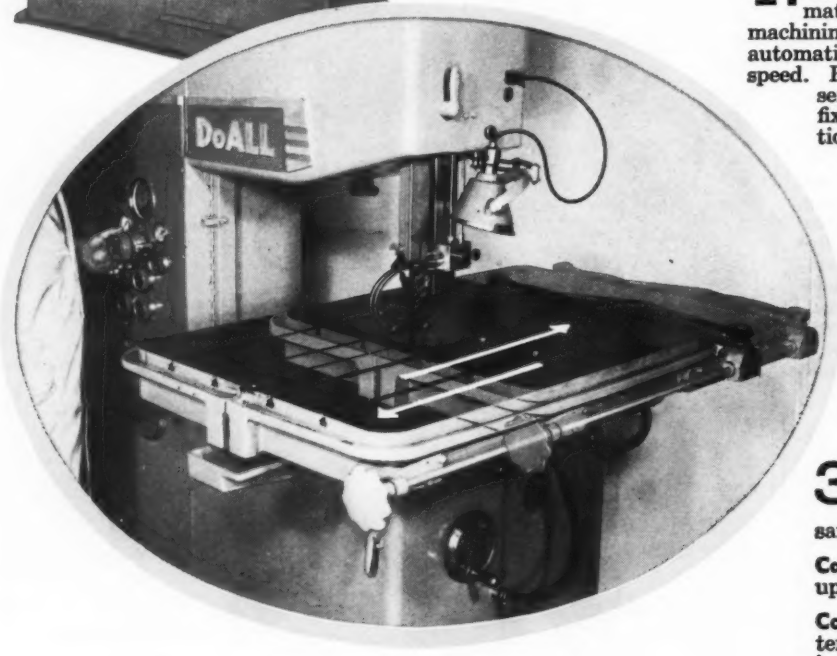
CIRCLE INFORM-A-GRAM KEY NO. 41

# RE-EVALUATE your BAND SAWING

# SEE Contour-matic® MACHINES



Model 26-3
One of a complete series of Contour-matics




**1. New Power Work Table** with calibrated work fixture on the Contour-matic removes the labor from band machining. Smooth-operating controls automatically coordinate feed and tool speed. Result: band sawing becomes semiautomatic with little or no fixturing for toolroom or production runs.

**2. New Cutting Tool** is the high-speed steel Demon* saw band. Its phenomenal properties permit performance that is 30 times longer than ordinary carbon steel blades. Tooth sharpness is retained at high temperatures, thus permitting heavy feeds at higher tool velocities to give maximum cutting rates and tool life.

**3. New Cutting Rates**—up 650%.

**Accuracy**—held within thousandths.

**Capacity**—table feeds heavy work up to 1,000 lb.

**Coolant**—mist or flood for extended tool life at maximum sawing rates.

## New Concepts of Band Machining Economy and Versatility

Contour-matic band machines are different. There is nothing else like them in the machining world. For machine tool replacements or additions, Contour-matics open new possibilities for the reducing of machining costs.

It is the choice of production personnel and methods engineers who have evaluated the band machining method. They find Contour-matics are their best machine tool investment.

Do what others are doing—question your band sawing and other machining methods by asking, "Can it be done on a Contour-matic?" Just call your local DoALL store for a free demonstration right in your own plant . . . or write.

B-56

**FREE—"Job Spotting" Service**

For your evaluation—
illustrated case histories of job savings made by the Contour-matics over former methods will be mailed to you periodically. Send us your name on company letterhead.

*Reg. T. M. The DoALL Company*

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## The DoALL Company, Des Plaines, Illinois

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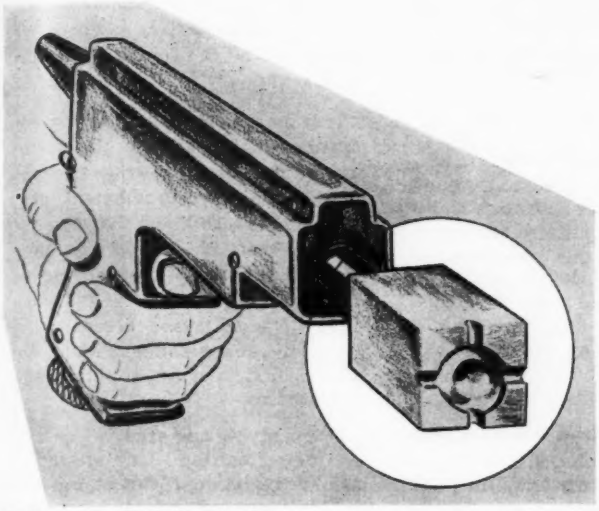


Courtesy of Tec Torch Company, Inc.

# CERAMIC JIG COMPONENTS

## . . . the answer to high temp tooling

*by Herbert Schwartz*
**Vice President**
**DURAMIC PRODUCTS, INCORPORATED**
**New York, New York**

THE INCREASING NEED for working with high temp materials has brought about extensive research in the high temperature processes. These fabrication processes, such as welding, brazing, sintering, and soldering, continually tax the ingenuity of tooling and production men in their efforts to satisfy unusual specifications. "How to fixture" is often a high hurdle.

In many cases high temperature steel, stainless steel, Inconel, and like alloys perform satisfactorily under hot conditions. However, the combination of sudden temperature changes (shock) and prolonged heat exposure creates problems of excessive fixture warpage and/or rupture in these metals. In addition, certain portions of a fixture must also withstand wetting by molten metals — usually not possible with all metal fixtures.

Ceramics, refractory by nature, with high heat and heat shock resistance, are now being used for many of these tooling applications. ThermoShock HT-2, a ceramic modified aluminum-silicate, derives its heat and thermal shock resistance mainly from two features of its processing: 1) HT-2 is fired at 2400°F, and 2) its formulation is carefully controlled so a thermal expansion rate very close to zero is achieved.

Having a low thermal expansion index, this material can withstand very rapid temperature changes, e.g., quenching from 2000°F without cracking. Continuous heats of 2200° F are not unreasonable and flash temperatures well in excess of this are possible. Thus, this newly developed ceramic satisfies high temp fixture requirements where ancient pottery products would not.

### Induction Brazing Jig

Illustrated in Figure 1 is an example of the use of ceramics for an

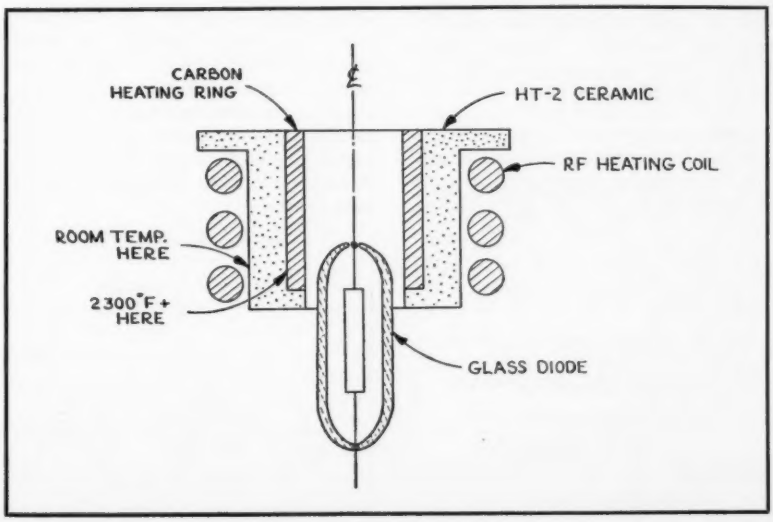



Fig. 1. A unique use of a ceramic bushing. A glass capsule is fused around a diode by passing them through an induction heated jig.

Fig. 2. A few of the great number of shapes possible for this high temp material.

induction brazing jig where again heat shock and electrical insulation are required in a tool. This is a remarkable application since the ceramic must remain stable during continuous 6-sec cycling between room temperature and 2300°F gradient.

**Furnace Brazing Jigs**

Examples of ceramic furnace brazing jig parts are the ceramic shapes (Fig. 2) used by an appliance manufacturer to locate parts to be braze-assembled. Ceramic fixturing locates the entire assembly, which is fired in a 5 min cycle from room temperature to 1200°F and then air quenched. Being stable itself, the fixture allows no movement of the work being assembled. Also, since molten metal won't stick to the ceramic locators, rejects are minimized.

Ceramic tooling is now playing a vital role in solving the critical problems faced by some electronic manufacturers; those who furnish precision silicon diodes, rectifiers, germanium transistors, and the like. One of the most critical operations in the area of manufacturing is the alloying of indium or aluminum to the germanium or silicon wafer. This carefully controlled process is accomplished at temperatures around 1600° F with the parts contained in an alloying jig ("boat," see Fig. 3). The jig material here must contain minimal reducible oxides which might cause contamination of the semi-conductor.

**Welding Locator**

Three important requirements are met by ceramics when used as aids in welding: 1) the jig must be insulated to permit the use of the shielded arc welding process — no arcing permissible; 2) the jig must have heat shock resistance; and 3) the jig should not be wettable by molten metal at welding heats.

**Copper Brazing Stop-Off Discs**

By incorporating precision ground 1½" dia x ¼" thick discs in a stainless steel fixture, an aircraft manufacturer satisfied his requirements. See Figure 4 for a sketch of this jet engine shroud and vane assembly. It was necessary that he contain a molten copper alloy at 2000°F and at the same time hold flatness tolerances in his assembly.

**What You Should Know About Ceramics**

Threading should not be used with this ceramic material. In place of threads the ceramic part should have through holes with adequate clearance for securing with metal bolts.

Where mechanical requirements are not severe, a ceramic cement may be used, or, in applications where the ceramic is exposed to surface heat only an epoxy cement may suffice.

The difference in the thermal expansion rate of ceramic materials as compared to metals must be allowed for. Failure to allow for clearance between parts "at temperature" can cause trouble. In some cases, where rigidity of the fixture will not allow adequate clearance, ceramic insulating tapes can be placed between the ceramic and metal parts. The tape will "give a little," permitting operation without breakage.

In order to reduce production costs there are many instances where ceramics can be pressed to size without machining.

Tool designers and production engineers should examine the methods of handling hi-temp ceramic tools in the shop. Production operators should also know that ceramic tools cannot be treated roughly. Men handling these tools should be properly indoctrinated. At the same time, the advantages inherent in the use of ceramic tooling should not be obscured because of their relative fragility.

In specifying and applying ceramics for fixturing tool designers should figure their closest tolerances for the ceramic parts to be in a plane perpendicular to the pressing axis, since in production this material is pressed in a manner similar to the production of powdered metal parts.

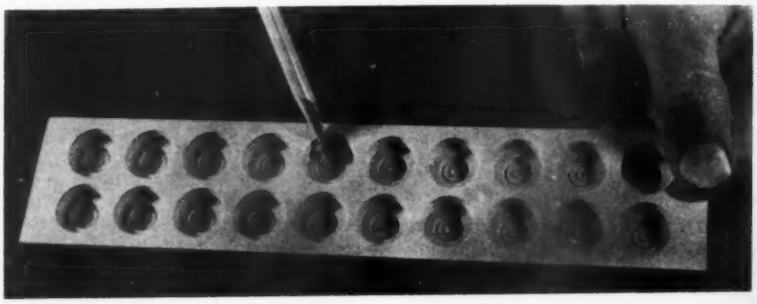


Fig. 3. Typical all-ceramic tooling — an alloying boat that permits processing of 20 transistors at one time. Tooling like this can be obtained semi-finished, soft enough for final machining and firing by the user.

Volumetric changes upon firing will vary little more than 1%. For close control, parts can be ground with silicon carbide which requires no lubricant to obtain dimensions as close as ±0.0001".

At present, ThermoShock ceramics can be had, in production volume, up to 2" in dia and up to 2" in length. end

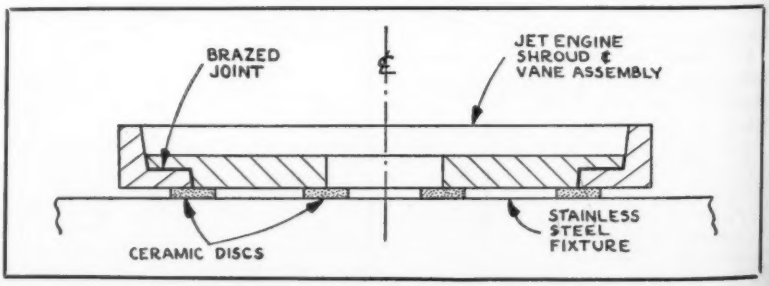



Fig. 4. Ceramic stop-off discs are used here during brazing of a jet engine shroud and vane assembly.

Fig. 1. Operator is shown placing part in press-mounted "Shimmy" die. Her right hand has just removed a trimmed part and its scrap.

# TRIMMING . . . a case history

How Borg-Warner improves work quality, eliminates further processing, and reduces total production time.

WHEN FABRICATING THOUSANDS of automobile transmission parts, uniformity is one of the stabilizers of quality. The factors assuring uniformity are: Maintenance of stock thickness throughout the fabrication processes; repeatability of machine tools; versatility and adaptability of machine tools required to handle similar parts; and certainly not least, the selection of the most suitable machines and tooling to do the job.

We found "Shimmy" dies best for our shell trimming operations.

We make two types of shells at our Bellwood plant, each requiring a different trim. The outer shell is approximately 12″ dia having a depth of 2¾″ and is made from 0.060″ stock; it requires a single trim. The inner shell has a 10½″ OD and a 6½″ ID and is made from 0.048″ stock; this requires a double trim. Since the two are eventually joined, uniformity is a must.

We used a rotary trim previous to applying the comparatively simple shimmy-die-action. Figure 1 shows the operator placing a part in one of these patented Brehm "Shimmy" dies. At the same time she removes a finish-trimmed part.

Through the installation of this tooling, furnished by the Vulcan Tool Company, Dayton, Ohio, we were able to realize a 40% reduction in overall production time. Among the features helping us in this saving is that one die can be used to trim a number of shells by merely changing cutting adaptors, thereby reducing equipment downtime.

A basic die is determined by the area of the largest shell and the heaviest gage to be trimmed — then additional shells of the same size, or smaller, can be trimmed in the same die. With this planning, basic dies are stocked and new adaptors are made to suit new shell-runs. Equipment costs can be kept to a minimum in this manner.

We learned too that the rotary machine (previously used) lacked sufficient rigidity to properly trim our stock thickness. Also, by our present method, we eliminate an after-trim lathe operation and end up with clean, flat, burr-free edges. We are able to maintain full stock thickness throughout. And, beside the elimination of the lathe operation, extra trim operations were not necessary since this method completes the job in one "stroke."

Die marks often found after a pinch trim, or roller marks after rotary trimming, are non-existent now. Without these marks we have been able to eliminate polishing.

We find it is possible to fabricate 500 outer shells an hour with our present setup as against 350 using other trimming methods. The production rate for the inner shell has shown a comparable increase to 700/hr as compared to 400 before. Not only do these parts meet rigid inspection tests but we have lowered rejections considerably.

### The Mechanics of the Operation

Since the die cutting members must move with the punch during a portion of its stroke, it is necessary that the die plate and attached members be supported by springs, or an

*by Adolph Bergetz*
**Master Mechanic**
**Spring Division**
**BORG-WARNER CORPORATION**
**Bellwood, Illinois**

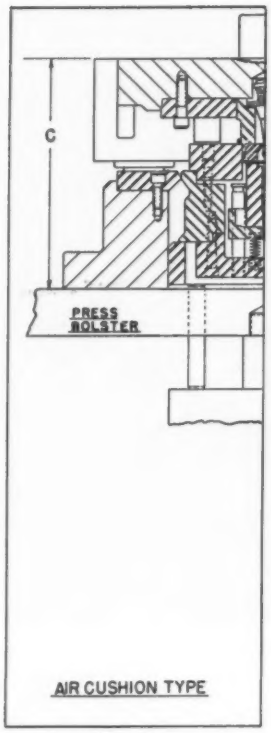



Fig. 2.

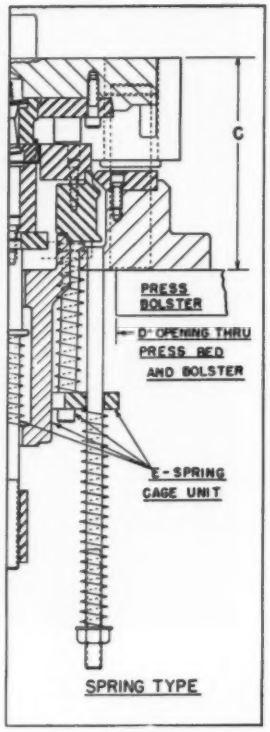



Fig. 3.

Figure 2 shows a "Shimmy" die mounted in a press equipped with an air cushion. In Figure 3 a mounted spring - actuated shimmy die is shown. In this instance it is necessary for the press to have a hole in its bolster plate.

air cushion. If your press is equipped with an air cushion, the "Shimmy" die can be purchased to utilize this feature; if not, the spring type is available. Here, we use the air cushion type since a more uniform pressure supports the die members. Also, less setup time is required.

The air cushion type has a greater shut height as can be seen by comparing C, in Figure 2, with that of C in Figure 3. With this system there are no springs to replace due to breakage or fatigue. Also, no opening is required through the bolster center.

With the spring type, the spring unit E and studs which hold it in position must be assembled to the die-shoe after it is positioned in the press. This is considerably more work and requires more initial setup time.

Besides being more troublesome the spring equipped die, by nature, can't give uniform internal die pressure; as the die closes the spring tension increases. Too, these springs having to extend through the press bed, dictate a smaller shut-height than is available with the air cushion operated die. However, if your presses are not equipped with air cushions the spring die may be satisfactorily used to trim parts up to 10" measured across the largest opening. Dies for parts over 10" should be operated with air cushions for best results.

After a "Shimmy" die is installed in a press, its action is as shown in Figure 4 (die open) and Figure 5 (die partially closed). As the press slide descends, the gage member L presses the part against the spring actuated ejector Q. Both are forced down until the studs K bear on the die plate M. Now, continued downward travel of the press causes the cams at E to function and downward travel is converted into horizontal movement of P. This carries the die plate M and due to its horizontal movement the work extending above M is sheared between it and punch J.

Although only one cam block (P) is shown, there are four of these, each having a series of cams arranged on their vertical faces at different heights. These function with stationary cams S as described above, and the camming action causes shearing from four consecutive directions, bringing about 360° shearing.

On the up stroke of the press the cam block is returned to the position shown in Figure 4 by means of the air cushion push rods or spring members, as the case may be.

During the entire cutting action, the studs K force the lower portion of the die down holding the cutting faces of the punch and die in a constant relationship.

Proper die clearance is obtained by grinding the punch J shorter than studs K. For example: The cutting clearance used in manufacturing parts out of a 0.100" thick metal is approximately 9%, or 0.009". This will vary with the material and its thickness.

To sharpen, the die plate M is surface ground to produce a new edge. To sharpen the punch, plate H is removed from the punch holder and the gage L is removed from the punch. The punch is then surface ground until sharp and the studs K are ground down the same amount to re-establish the original cutting clearance.

Although most dies have standard cam movements suitable for trimming an entire edge in one plane, it is possible to vary the cam movement sequence or the number of movements to obtain results on unusual edge configurations. end

Fig. 4.

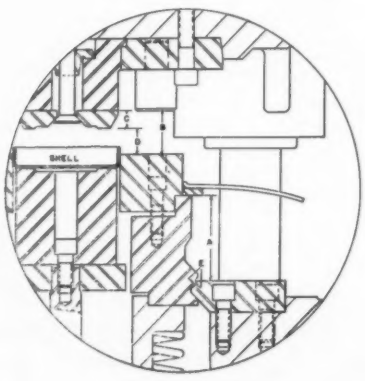
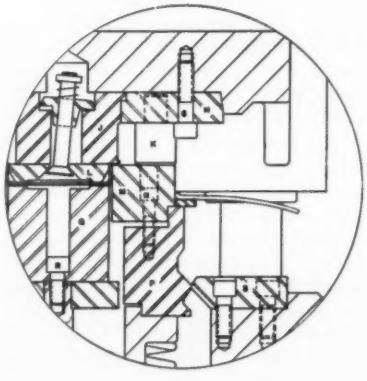



Fig. 5.



In Figure 4 a shell has been placed in an open die. Figure 5 shows the die closed with trimming under way. Stationary cam S has forced the lower components, including the part, to the left to induce a shearing action between J and M. The next phase of the shear cycle will take place to the rear, then to the right, and finally to the front.

# A picture story . . .

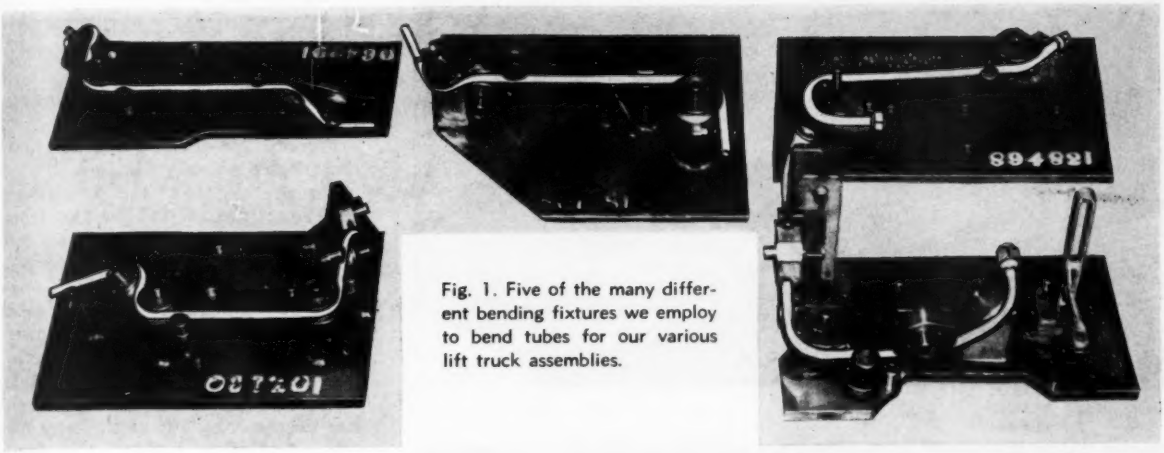


Fig. 1. Five of the many different bending fixtures we employ to bend tubes for our various lift truck assemblies.

# ECONOMICAL BENDING FIXTURES

*by Howard Willard*
**Departmental Superintendent of**
**THE YALE & TOWNE MANUFACTURING COMPANY**
**Chicago, Illinois**

BENT TUBES ARE OFTEN NECESSARY in small lots, and more than likely their angularity must agree with a part print. In order to assure uniformity — a must to keep down labor costs when tubes are assembled into our equipment — they should be bent in fixtures. Since the lots are small and fixtures will only be used occasionally, the fixtures should be inexpensive.

For the most part, tubes we bend are ¼" to ¾" dia stainless steel, but some are copper or copper coated steel. Most of these have bends in several planes.

We were unable to find a standard bending machine that would do our many jobs without considerable setup, so we decided to make a simple fixture for each size and shape required. We have more than 50, some of which are shown in the following photos. Each fixture has a baseplate that can be clamped quickly to a common pedestal or bench. In turn each baseplate has, by welding or bolting, appropriate blocks that carry grooved wheels, about which tubes can be bent. These grooved wheels rotate about pivot pins for the hand bending tools. Note that the pivots extend past the outside face of the grooved

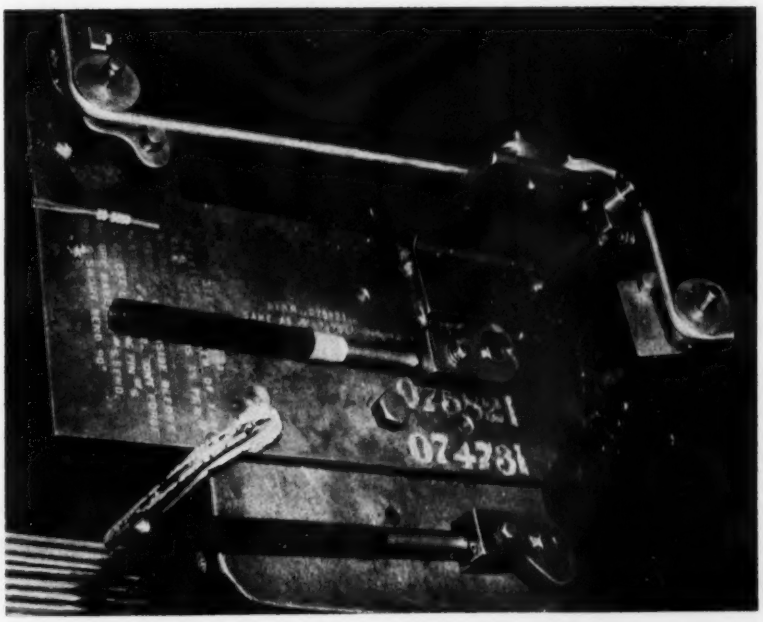


Fig. 2. Closeup of one fixture and its tools for making a five bend tube. Tube is ready for removal.

Fig. 3. Making the third bend in the tube in the same fixture as seen in Figure 2. The tool pivots on a pin extending through one of the grooved bending wheels. One bending block is shown swung out of the way pending completion of the fourth bend.

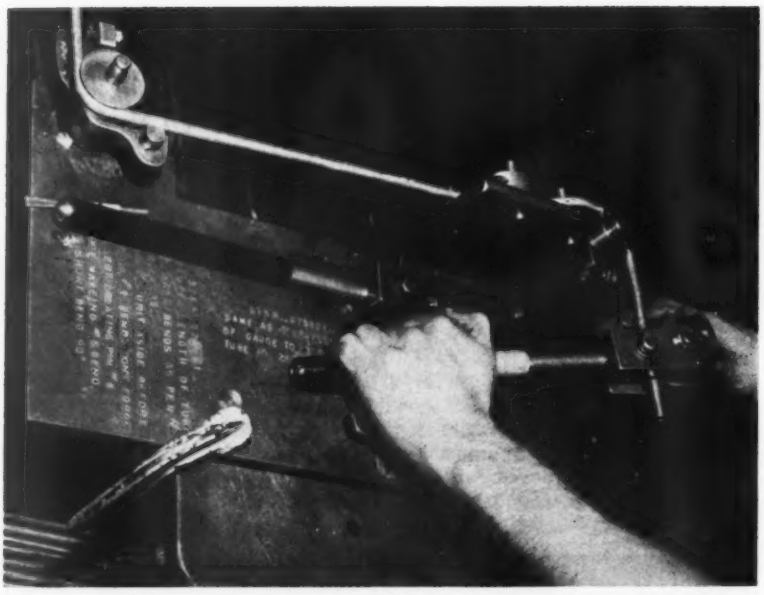


Fig. 4. Same fixture. One of the tools is shown making the final bend on the movable block that is now swung into place.

wheel. It is often necessary to use more than one hand tool per fixture.

Each fixture is stamped with the sequence of its operation, although this is usually obvious.

When any lot of bent tubes of a given size and shape is required, this number of straight lengths are delivered to the bending bench. The operator then selects the proper fixture from storage and secures it with an ordinary "C" clamp. Then he proceeds by using tools in their proper sequence. Each length remains in the fixture until all bends are complete, assuring strict relationship of one to another. In effect, the fixture becomes a gage.

Figures 2-5 inclusive show how one fixture is used.

Figure 2 shows the completed tube in its fixture and the two tools used. One of these, pivoting on the pin above the upper left grooved wheel, made the first bend.

Photos showing first and second bends being made are not shown, but bend 3 is in process in Figure 3. Also to be noted in Figure 3 is the block at the upper left which has been swung out of the way for bend 4. Before making the final bend this block is pivoted into place and held by a pin. Figure 4 shows the final bend being made. Notice its angle is compounded.

The completed tube is shown again in Figure 5. Here it is seen from the opposite side than that shown in Figure 2.

Since these fixtures are inexpensive, each can be made to fit a particular set of conditions, rather than a more confusing sub-assembly setup. In some instances blocks have to be made removable and to swivel for clearance. Some fixtures are designed to produce either right or left hand configurations. In many cases the hand tools utilize the end of an elongated slot to pivot on. The slot allows the tool to be removed more easily after a bend is made.

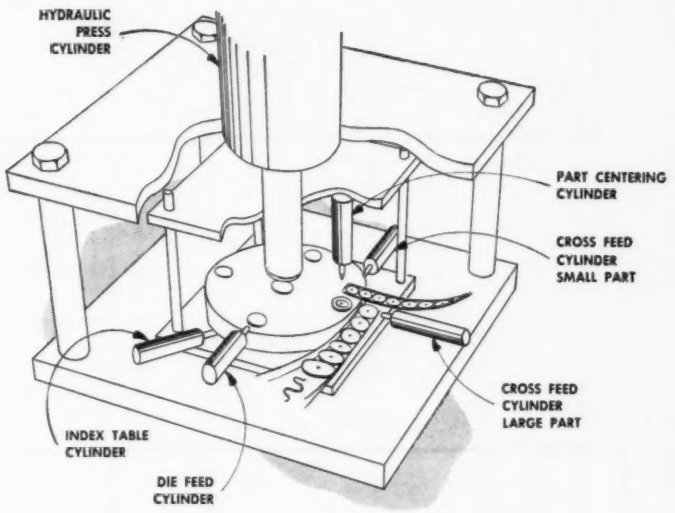
Bending this way requires little manual effort because of the leverage provided. And, it is not unusual to make multi-bend parts at a 75 pc/hr rate. end

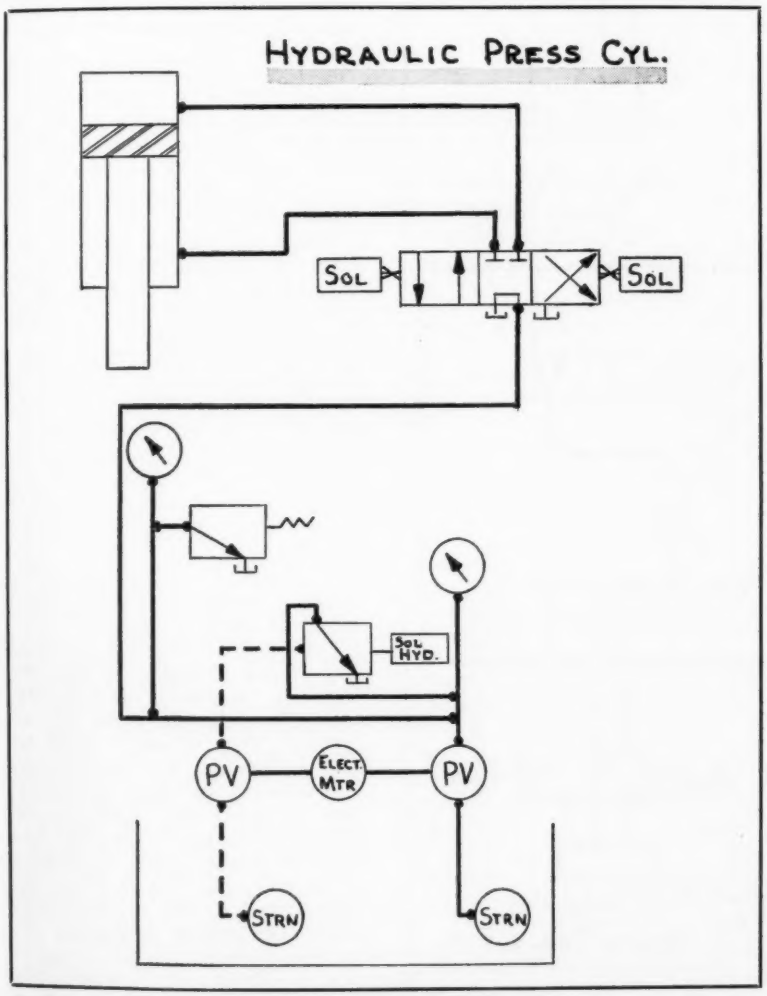
Fig. 5. Same fixture, only from the other side — all bends completed.

# TIMING AND SEQUENCING

## . . . how it's done

*by Inmon V. Hale*
**Engineer**
**HARTZELL PROPELLER INCORPORATED**
**Piqua, Ohio**
*and William E. Hoffman*
**Associate Editor**



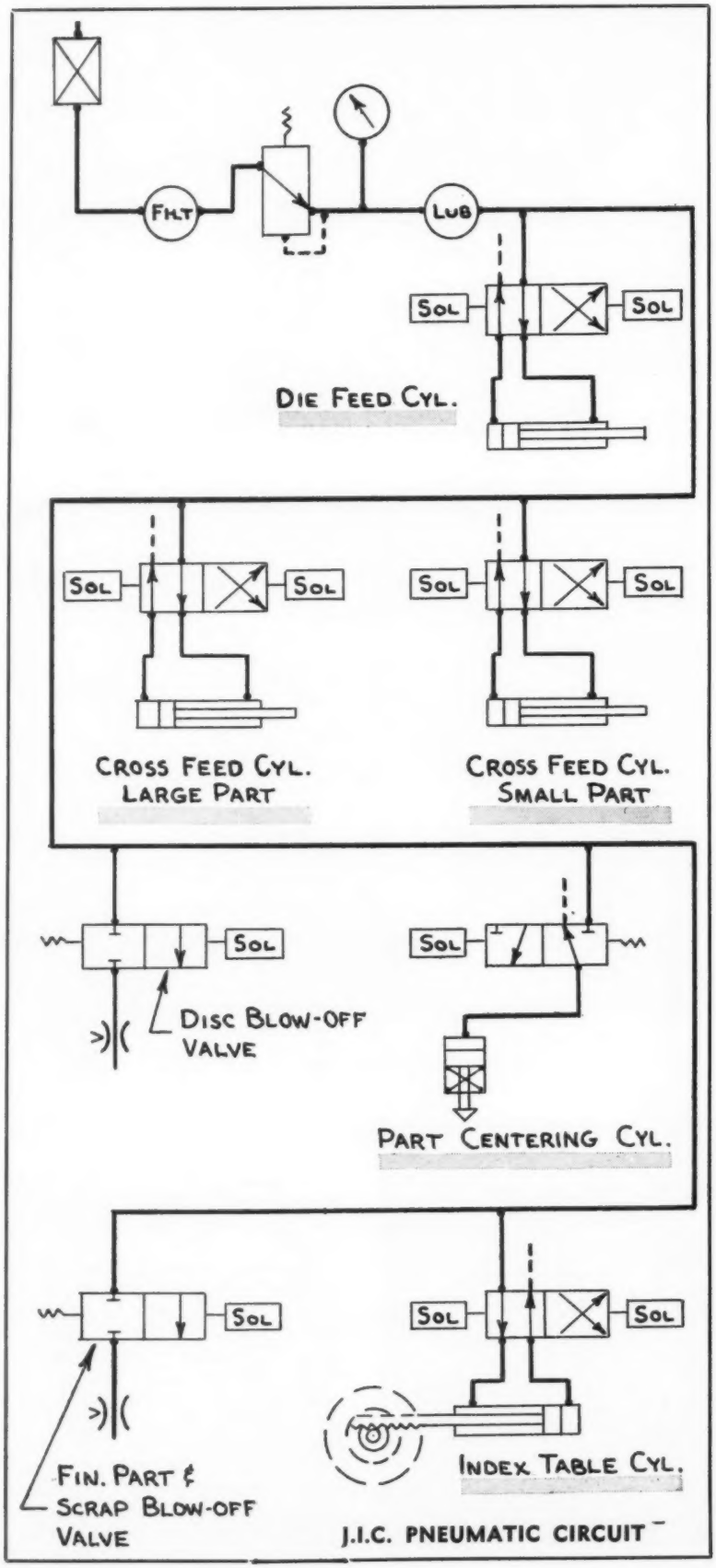

**J.I.C. HYDRAULIC CIRCUIT**

TIMING AND SEQUENCING an automatic machine can be a worrisome thing to the once-in-a-while designer; knowing and using the system explained here will be helpful. It's a graphic way to handle sequencing components in the shortest design time in an orderly way; it helps avoid disconnected thoughts, false starts, and improper machine cycling.

To the experienced designer, time and sequence problems may be routine, but a fresh approach is always in order.

There are others concerned with a machine besides the design people, process men, detailers, and checkers; a real need for an operational guide is usually experienced by those who will build, set up, run, and maintain a machine. All concerned should have a rundown on its functions and how they come about. In chart form this rundown won't suffer misinterpretation — everyone gets the same story.

In addition to saving the *designer*




time, this makes it easier for him to reduce the number of limit switches and relays, and the amount of conduit. He can see at a glance the coincidence of two or more functions which would allow the same work to be done by one signal. This can mean a savings in expensive valving also, as one valve may serve several cylinders.

The *builder* can have, along with a better understanding of the motions, a guide for setting the controls for maximum performance. He can also tell where to arrange limit switches in order that they may be tripped by the proper cylinders and at the proper end of a cylinder's stroke.

The *electrician* must have the story to make up his "harness." Where better can he identify switch, valve, and relay relationships than from the same source of information used by others before him.

Finally, when the machine is installed for production, the *setup man* and the *operator* will need a means of understanding and pinpointing trouble spots. And, although the *maintenance man* is expected to be the wizard-of-all, he too can profit by the use of this machine "traveling companion." From it he can tell when he has the machine timed and sequenced again after a shut down.

Before starting the chart the designer should have this information: Number of parts/min expected of the machine at full capacity; stroke length of each cylinder and its cycle time (obtain from manufacturer); length of time that part should be held in each station; what reaction time will be allowed each relay and solenoid valve — not less than 0.2 sec is a good rule; and a listing of motions in sequence to carry out the intended work of the machine.

The chart (Fig. 1) for a pneumatic hydraulic assembly machine illus.) was made like this:

Functioning machine components were listed vertically to the left; these are the motion producing elements that must be timed and sequenced. They should be listed (as near as possible) in a sequence corresponding to the one they will follow in actual use. Allow enough space between each so that their two positions may be noted, e.g. forward or retracted. This machine is so designed that all six cylinders start from a retracted or up position. The two components other than cylinders are the finish-part-blow-off-valve, and the disc-blow-off-valve. Both are closed at the start of a cycle.

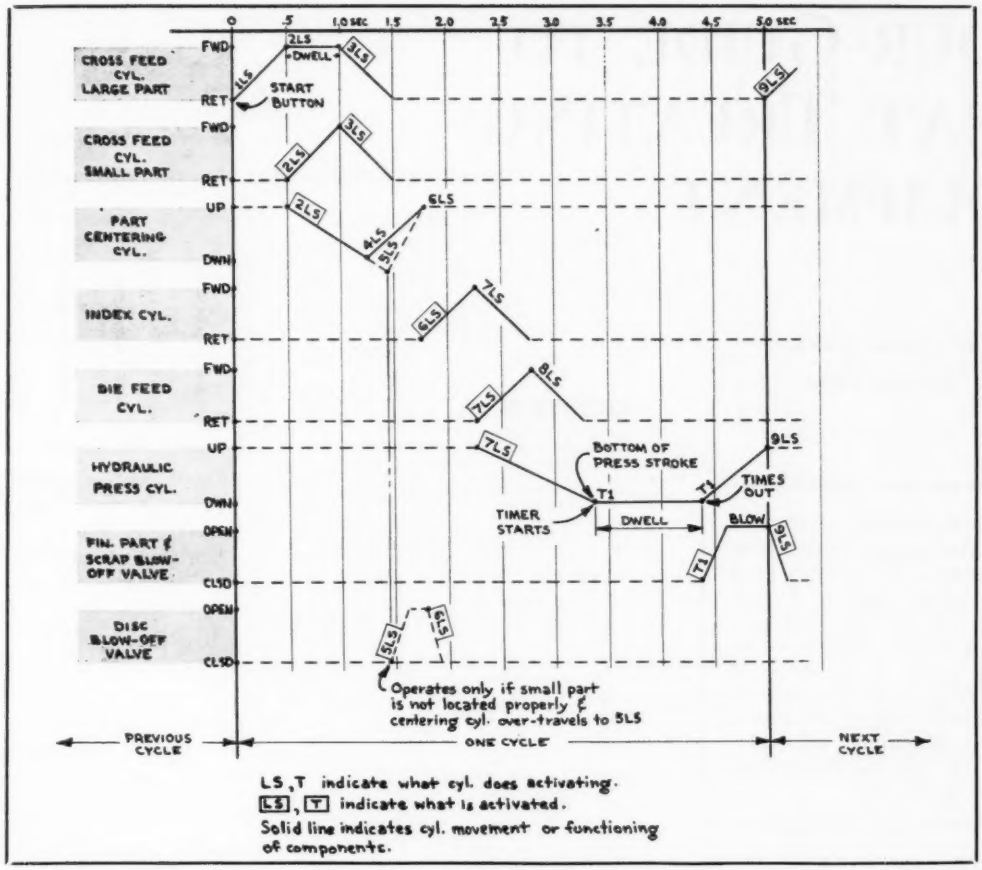



FIGURE 1

At the top of the chart, and horizontally, spaces were laid out to represent a suitable reaction time for all elements involved. In this case 0.5 sec seemed to be suitable.

So then, with a skeleton chart, the movements of each element were plotted for a graphic picture of their relationship. In doing so we wrote-in limit switch (LS) one, or start button, near the start position of the first element to be activated. The start button activates the solenoid valve, causing forward movement of cross-feed-cylinder to feed a large part onto the index table.

When advanced, this cylinder trips 2LS which energizes the solenoid-valve for movement of the next cross-feed-cylinder. This cross-feed-cylinder loads a small part on top of the large one; the 2LS also triggers another solenoid-valve to start part-centering-cylinder down.

It takes 0.5 sec to load a small part, so the centering-cylinder must be slowed (by flow-control-valve) to do its centering 0.25 sec after the small part was loaded. This allows the small-part-feed-cylinder to start back and out of the way. The return of the small-part-feed-cylinder is initiated by 3LS being tripped, which also causes the return of the large-part-feed-cylinder.

Should the as-loaded parts not be aligned well enough for exact alignment by centering cylinder, the centering cylinder will over travel, contacting 5LS to energize the solenoid of the disc-blow-off-valve. By blowing off unaligned parts die wear and breakage are held to a minimum. Both 4LS and 5LS are arranged to return this centering-cylinder to its up position. Limit switch 4 (LS) is a pressure switch which doesn't function in case of an over travel.

When the centering-cylinder returns to its up position 6LS is triggered. This shifts the solenoid-valve which will send the index-cylinder into action, and a new set of parts is indexed in front of the die-feed-cylinder.

At the end of this index, 7LS is tripped causing die-feed-cylinder-solenoid-valve to move its cylinder out. This loads parts to be assembled under the hydraulic press cylinder. Simultaneously, 7LS causes the hydraulic-press-cylinder to start down. The cylinder's speed is arranged so that it doesn't bottom on the work until after the die-feed-cylinder has loaded the parts. The feed cylinder then trips 8LS and is returned.

Since the work done by the hydraulic-press-cylinder requires a hold pressure phase in its cycle a timer is started at the bottom of its stroke. After the dwell period the timer "times out," returning the hydraulic-cylinder to its up position.

As the timer goes off it also triggers the solenoid-valve to blow off the now assembled parts. This "blow" continues until the hydraulic-press-cylinder triggers its shut off through 9LS.

The second and successive cycles are started by 9LS, which is tied in with 1LS, the manual start button.

The chart should be made as soon as preliminary sketches of the machine are complete. At that time the designer has a fair idea of what he expects his "brain-child" to do and some idea of how it will look. He will soon be able to capitalize on the various savings mentioned above, as well as know where to revise his preliminary thinking.

An added bonus should be noted: This chart will be a great time saver to the pneumatic, hydraulic, and electrical engineers as they lay out their circuitry.

end

# YOUR GUIDE TO HEAT TREATING EQUIPMENT

*by Charles Weiner*
**Assistant Editor**

Proper equipment as well as metallurgical know-how is essential for quality heat treating processing. This is why, market-wise, there is such a wealth of equipment from which to choose; and also why, application-wise, the choice must be based on an adequate appreciation of the technological state of the art.

TO AID YOU IN THE SELECTION of equipment to meet current or future heat treating needs, Tooling & Production has compiled a list of equipment manufacturers and their products. In our survey of these manufacturers we found that most were anxious and able to help companies solve specific heat treating problems.

Types of furnaces and their construction were described in the first article of the Heat Treating Today Series, which appeared in the March issue of Tooling & Production. The categories included in this month's survey of manufacturers are briefly described below:

*Liquid Bath Furnaces* — For uniform heating and surface control. Baths are usually chemical salts, but molten lead or oil baths are also used. Available in sizes from small pot types for toolroom applications, to large tanks with mechanical work handling equipment for continuous production applications. Temperature ranges vary according to application.

**MANUFACTURERS OF HEAT TREATING EQUIPMENT**

| MANUFACTURERS | LIQUID BATH FURNACES | FLAME HARDENING | CONTINUOUS FURNACES | BATCH FURNACES (Production) | INDUCTION HEATERS | VACUUM FURNACES | BATCH FURNACES (Small—Tool & Die) | ATMOSPHERE GENERATORS |
|---|---|---|---|---|---|---|---|---|
| Ajax Electric Company<br>Delaware Avenue at Frankfort Avenue<br>Philadelphia 23, Pennsylvania | x | | x | x | | | x | |
| Ajax Magnethermic Corporation<br>3990 Simon Road<br>Youngstown 7, Ohio | | | x | x | x | x | x | |
| Allis-Chalmers Manufacturing Company<br>Box 512<br>Milwaukee 1, Wisconsin | | | | | x | | | |
| A. D. Alpine, Incorporated<br>11837 Teale Street<br>Culver City, California | | | | x | | | x | |
| American Electric Furnace, Inc.<br>300 Freeport Street<br>Boston 22, Massachusetts | x | | x | x | | | x | x |
| American Gas Furnace Company<br>140 Spring Street<br>Elizabeth, New Jersey | x | x | x | x | | x | x | x |
| Bellevue Industrial Furnace Co.<br>2620 Crane Avenue<br>Detroit 14, Michigan | x | | x | x | | x | x | x |
| The Cincinnati Milling Machine Co.<br>Meta-Dynamics Division<br>4701 Marburg Avenue<br>Cincinnati 3, Ohio | | x | | | x | | | |
| Consolidated Electrodynamics Corp.<br>Rochester Division<br>1775 Mt. Read Boulevard<br>Rochester 3, New York | | | | | | x | | |
| Cooley Electric Manufacturing Corp.<br>38 South Shelby Street<br>Indianapolis 7, Indiana | | | x | x | | | | |
| Dempsey Industrial Furnace Corp.<br>125 Main Street<br>Springfield, Mass. | x | | | x | | | x | |
| The Denver Fire Clay Company<br>3033 Blake Street, P. O. Box 5510<br>Denver 17, Colorado | x | | | x | | | x | |
| Despatch Oven Company<br>619 South East 8th Street<br>Minneapolis 14, Minnesota | | | x | x | | | x | |
| Drever Company<br>Red Lion Road and Philmont Avenue<br>Bethayres, Pennsylvania | | | x | x | | x | | x |
| Dun-Mar Engineering Corporation<br>1102-03 House Building<br>Pittsburgh 22, Pennsylvania | x | | x | x | | | | |
| Ecco High Frequency Corporation<br>7020 Hudson Boulevard<br>North Bergen, New Jersey | | | | | x | x | | |
| Electric Arc, Incorporated<br>152 Jelliff Avenue<br>Newark 8, New Jersey | | | | | x | | | |
| The Electric Furnace Company<br>Wilson Street and Penna. Railroad<br>Salem, Ohio | | | x | x | | x | | x |
| The Gas Machinery Company<br>16100 Waterloo Road<br>Cleveland 10, Ohio | | | x | x | | | x | |
| General Electric Company<br>Apparatus Sales Division<br>One River Road<br>Schenectady 5, New York | x | | x | x | x | x | x | x |
| Grieve-Hendry Company, Inc.<br>1401 West Carroll Avenue<br>Chicago 7, Illinois | | | | x | | | | |

*Flame Hardening* — Many applications in localized hardening of parts such as gear teeth or intricately shaped work. Electronic temperature control and automatic work handling devices are available in many models.

*Continuous Furnaces* — Heat source is either gas, oil, or electricity. Most models can be used with controlled atmospheres. Temperature range and sizes vary according to application and nature of production. Types are listed below:

a) Rotary Hearth—Work is moved through the furnace by rotation of the hearth. Used for high production rates in a compact area.

b) Shaker Hearth—Work is placed on hearth which moves forward and then reverses rapidly causing the work to slide forward through the furnace. Used for screw machine type parts or small stampings.

c) Roller Hearth—Rotation of rollers transports the work through the furnace.

d) Pusher—A ram pushes the work through the furnace.

e) Conveyor — Work is moved through the furnace on a continuous conveyor belt.

*Batch Furnaces (Production)* — Heat source is either gas, oil, or electricity. Most models can be used with controlled atmospheres. Temperature range and sizes vary according to application and nature of production. Types are listed below:

a) "All-purpose" (with built-in quench) — Atmosphere furnace with forced convection and integral quench. Can be used for many different processes by changing the atmosphere. Automatic operation on some models.

b) Box—Rectangular shaped. Work loaded in trays and charged into furnace through door in front.

c) Pit — Removable lid. Work loaded through top. Often installed below floor level.

d) Bell—Cylindrical top lowers over the work.

e) Car—Work is loaded on car, which is moved on tracks into furnace chamber. Used for large bulky parts. Some models can be used in a continuous application.

f) Elevator—Work is loaded on elevator and raised into furnace through bottom opening.

. . . Chart continued on following page

| MANUFACTURERS | LIQUID BATH FURNACES | FLAME HARDENING | CONTINUOUS FURNACES | BATCH FURNACES (Production) | INDUCTION HEATERS | VACUUM FURNACES | BATCH FURNACES (Small—Tool & Die) | ATMOSPHERE GENERATORS |
|---|---|---|---|---|---|---|---|---|
| Harper Electric Furnace Corporation<br>110 Pearl Street<br>Buffalo 2, New York | | | x | x | | | | |
| C. I. Hayes, Incorporated<br>800 Wellington Avenue<br>Cranston 10, Rhode Island | | | x | x | x | x | x | x |
| Hevi-Duty Electric Company<br>2040 West Wisconsin Avenue<br>Milwaukee 1, Wisconsin | x | | x | x | | x | x | x |
| High Vacuum Equipment Corp.<br>Two Churchill Road<br>Hingham, Massachusetts | | | | | | x | | |
| Holcroft and Company<br>6545 Epworth Boulevard<br>Detroit 10, Michigan | | | x | x | | | | |
| The A. F. Holden Company<br>14341 Schaefer Highway<br>Detroit 27, Michigan | x | | x | x | | | x | |
| Charles A. Hones, Inc.<br>2473 South Grand Avenue<br>Baldwin, L. I., New York | x | | | x | | | x | |
| K. H. Huppert Company<br>6830 Cottage Grove Avenue<br>Chicago 37, Illinois | | | | x | | x | x | |
| Induction Heating Corporation<br>181 Wythe Avenue<br>Brooklyn 11, New York | | | | | x | | | |
| Industrial Heating Equipment Co.<br>3570 Fremont Place<br>Detroit 7, Michigan | x | | x | x | | | x | x |
| Ipsen Industries, Inc.<br>715 South Main Street<br>Rockford, Illinois | | | x | x | | x | x | x |
| Johnson Gas Appliance Company<br>520 E. Avenue, N. W.<br>Cedar Rapids, Iowa | x | | | | | | x | |
| Johnston Manufacturing Company<br>2825 East Hennepin Avenue<br>Minneapolis 13, Minnesota | x | | x | x | | | x | |
| The C. M. Kemp Manufacturing Co.<br>405 East Oliver Street<br>Baltimore 2, Maryland | | | | | | | | x |
| Kinney Vacuum Equipment Division<br>The New York Air Brake Company<br>1325 Admiral Wilson Boulevard<br>Camden 11, New Jersey | | | | | | x | | |
| L & L Manufacturing Company<br>Industrial Division<br>800 Mulberry<br>Chester, Pennsylvania | | | | | | | x | |
| Laboratory Equipment Corporation<br>Post Office Box 151<br>St. Joseph, Michigan | | | | | x | | | |
| Leeds and Northrup Company<br>4901 Stenton Avenue<br>Philadelphia 44, Pennsylvania | | | | x | | | | x |
| Lepel High Frequency Labs, Inc.<br>55th and 37th Avenue<br>Woodside 77, L. I., New York | | | | | x | | | |
| Lindberg Engineering Company<br>2450 West Hubbard Street<br>Chicago 12, Illinois | x | | x | x | x | x | x | x |
| Loftus Engineering Corporation<br>One Gateway Center<br>Pittsburgh 22, Pennsylvania | | | x | x | x | | | |
| Lucifer Furnaces, Inc.<br>Easton Pike<br>Neshaminy, Pennsylvania | x | | | x | | | x | |
| The Carl Mayer Corporation<br>20800 Center Ridge Road<br>Cleveland 16, Ohio | | | x | x | | | x | |
| NRC Equipment Corporation<br>160 Charlemont Street<br>Newton Highlands 61, Mass. | | | | | | x | | |
| New Rochelle Tool Corporation<br>320 Main Street<br>New Rochelle, New York | | | | | x | | | |

| MANUFACTURERS | LIQUID BATH FURNACES | FLAME HARDENING | CONTINUOUS FURNACES | BATCH FURNACES (Production) | INDUCTION HEATERS | VACUUM FURNACES | BATCH FURNACES (Small—Tool & Die) | ATMOSPHERE GENERATORS |
|---|---|---|---|---|---|---|---|---|
| The Ohio Crankshaft Company<br>3800 Harvard Avenue<br>Cleveland 5, Ohio | | | | | x | | | |
| Pacific Industrial Furnace Company<br>24680 Telegraph Road<br>Detroit 41, Michigan | x | | | x | | | | |
| Pacific Scientific Company<br>25 Stillman Street<br>San Francisco 22, Calif. | | | | x | | x | | x |
| Pereny Equipment Company<br>393 Chambers Road, Box 8153, Sta A<br>Columbus 12, Ohio | | | x | x | | | x | |
| Pittsburgh Induction Heating Co., Inc.<br>615 Washington Road<br>Pittsburgh 28, Pennsylvania | | | | | x | | | |
| R-S Furnace Company, Inc.<br>North Wales, Pennsylvania | | | x | x | | | | |
| Radio Frequency Company, Inc.<br>44-46 Park Street<br>Medfield, Massachusetts | | | | | x | | | |
| Reeve Electronics, Inc.<br>609 West Lake Street<br>Chicago 6, Illinois | | | | | x | | | |
| W. S. Rockwell Company<br>200 Eliot Street<br>Fairfield, Connecticut | x | | x | x | | | x | x |
| Salem-Brosius, Inc.<br>Post Office Box 2222<br>Pittsburgh 30, Pa. | | | x | | x | | | |
| Sargeant & Wilbur, Inc.<br>180 Weeden Street<br>Pawtucket, Rhode Island | | | x | x | | | x | x |
| Scientific Electric, Inc.<br>105-119 Monroe Street<br>Garfield, New Jersey | | | | | x | | | |
| Selas Corporation of America<br>Dresherton Road & Lime Kiln Pike<br>Dresher, Pennsylvania | | x | x | x | | | | |
| The Sentry Company<br>64 Main Street<br>Foxboro, Massachusetts | x | | | x | | | x | |
| Sherman Industrial Electronics Company<br>Division of Engineering Design, Inc.<br>108 North Gill Street<br>State College, Pennsylvania | | | | | x | | | |
| Sunbeam Corporation<br>Industrial Furnace Division<br>180 Mercer Street<br>Meadville, Pennsylvania | x | | x | x | | x | x | x |
| Surface Combustion Corporation<br>2375 Dorr Street<br>Toledo 1, Ohio | x | | x | x | | | x | x |
| Swindell-Dressler Corporation<br>Post Office Box 1888<br>Pittsburgh 30, Pennsylvania | | | x | x | | | | |
| Sylvester & Company<br>17706 Miles Avenue<br>Cleveland 28, Ohio | | | x | | | | | |
| Thermo-Electric Manufacturing Co.<br>500 Huff Street<br>Dubuque, Iowa | | | | | | | x | |
| Trent, Incorporated<br>201-299 Leverington Avenue<br>Philadelphia 27, Pennsylvania | x | | x | x | | | x | |
| Waltz Furnace Company<br>1901 Symmes Street<br>Cincinnati 6, Ohio | x | | | x | | | | |
| Wayne Industrial Furnace Company<br>622 S. Alexander<br>Royal Oak, Michigan | | | x | x | | | | |
| Westinghouse Electric Corporation<br>Industrial Electronics Dept.<br>2519 Wilkens Avenue<br>Baltimore 3, Maryland | | | | | x | | | |
| Lee Wilson Engineering Co., Inc.<br>20005 West Lake Road<br>Cleveland 16, Ohio | | | x | x | | | | x |

*Induction Heaters*—Accurate, high speed heating for selective hardening. Many models are available with automatic work handling fixtures. A frequency generator is needed—often supplied by manufacturer.

*Vacuum Furnaces*—For vacuum heat treating of reactive metals and alloys. Sizes range from small laboratory types to large vertical types for missile applications. Extremely high temperatures are obtainable.

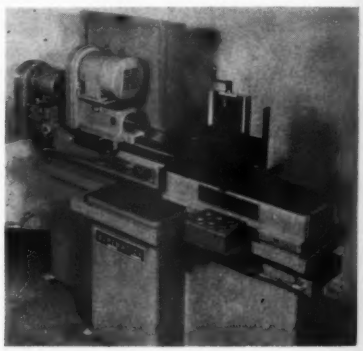
*Batch Furnaces (Small, for tools and dies)*—For toolroom applications such as tempering, or hardening of tools and dies. Usually box type. Average working dimensions from 10″ wide x 18″ deep x 8″ high, to 15″ wide x 24″ deep x 18″ high. Temperature ranges vary with applications.

*Atmosphere Generators*—For use as source of protective atmosphere. Types vary according to application. end

**Reprints of this Guide to Heat Treating Equipment are available. Send request to the Editor, Tooling & Production.**

## GUN DRILLING MACHINE CUTS EXTRA FINISHING

A uniform feed rate which holds vibration to a minimum on the Boremation gun drilling machine, results in longer tool life, improved hole finish, and accurate hole alignment. This often eliminates the need for expensive secondary operations.

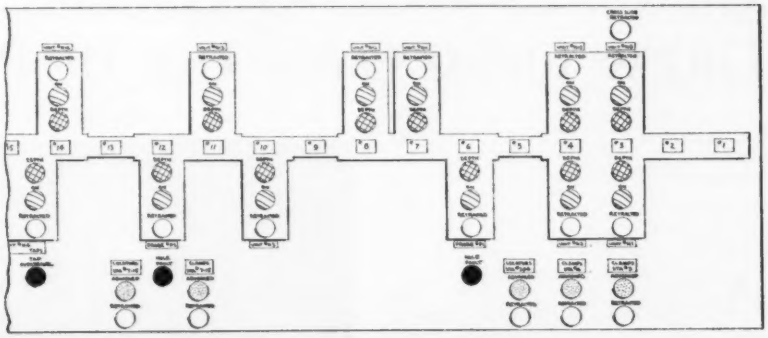


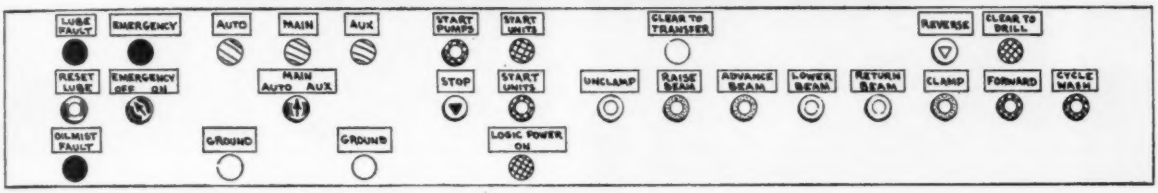
Feed range on the machine is infinitely adjustable and extends from ½ to 30 ipm. Spindle speeds range from 100 to 10,000 rpm. The feed and speed is selected by the operator and is held constant once the adjustment is made. Tolerances of 0.0001″ can be maintained.

The machine, built by Drillmation Co., Inc., is adaptable for high production cycle, short hole drilling, maintaining the desired hole tolerances in one pass. With mechanical stop attachment, hole depths can be repeated within 0.001″ in most cases with either single, dual, or multiple spindles.

CIRCLE INFORM-A-GRAM KEY NO. N8

# VERSATILE CONTROL OF AUTOMATED LINE






Color Key: ● Red, ▨ Amber, ○ Clear, ▩ Green, ◉ Blue.

A COMBINATION OF various types of well-chosen controls and building block construction are teamed up by Buhr Machine Co. engineers in an automatic transfer line for machining, washing, and inserting a bearing into 170 aluminum automatic transmission extensions an hour.

Both old and new control techniques are responsible for the line's smooth operation, whether on "automatic" or "manual." All electrical interlocks are controlled by static control units. Old standbys — precision limit switches, pushbuttons, and transformer-type pilots — have not been overlooked, however, in the effort to make the machine line safe, simple, and sure.

A glance at the control console tells a good part of the story. Within easy reach are the switches and pushbuttons that give the operator control of the 85' long, 36-station line, even though the line is classed as automatic. When under automatic control, the pushbuttons normally don't need "pushing." But, when switched to "Main" (manual), the operator controls all operations in the line's cycle by actuating pushbuttons in succession from left to right.

Just above these controls is a scaled-down plan of the machine layout set with varicolored pilot lights. These light up as the various stations are actuated, keeping the operator informed of the conditions at all the operating stations. Trouble spots can be located immediately by glancing at this monitor if the machine should stop suddenly because, for instance, of a broken tool or missing drill hole. The panel keeps track of more than 60 operations.

During automatic machine cycling, the operator loads a part in the first station, presses both cycle "Start" buttons to preset a cycle, and the controls take over.

With the cycle selector switch turned to "Main," the pushbuttons on the console are used. A pushbutton is provided for each movement of the walking-beam transfer device, forward and reverse, and to clamp and unclamp the parts. When the units are sent forward, the part indexes operate once, and stop until the beam has transferred. A pilot light on the monitor panel signals the completion of each movement. If the buttons are pushed in sequence from left to right, the machine runs through a complete cycle, one step at a time.

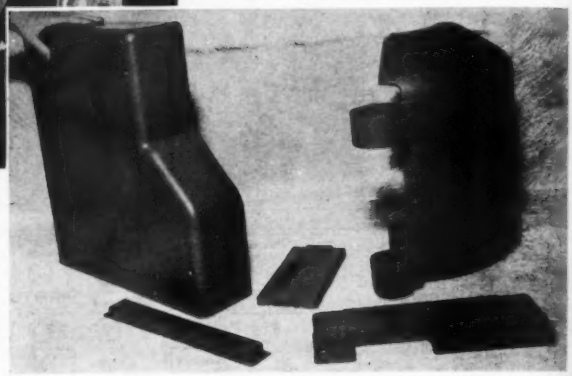
With the selector switch on "Aux," the pushbuttons for the variout head units, the part indexers, and the unloader are effective. A unit can be jogged in either direction during setup or maintenance by holding both the "forward" and "reverse" buttons depressed and then momentarily releasing the button for the direction opposite the desired travel.

A unit can be stopped at any point by depressing both buttons momentarily while the unit is in motion. With the selector switch in the "Aux" position, pushbuttons on the console (except the "Stop" button) are ineffective. Turning a unit selector to "Off" stops the spindle motor and prevents any motion of the unit. end

# A T & P Tour - -

# GISHOLT'S DEPARTMENT GREW FROM OWN USE OF PLASTICS

Fig. 1. Neat-looking lightweight plastic panels are easily removed or replaced by one man. Matched metal die molding techniques were used to produced 3000 of the 22" x 21" x 15" housings (inset) at Gisholt. Standard fasteners are molded into the parts.



A TOUR THROUGH THE PLASTICS Department of Gisholt Machine Company gives convincing proof that the company has entered the plastics fabricating field in a big way . . . even though it wasn't thought of as a possible contract service when it was started. Successful use of strong, lightweight, economical plastic panels, covers,

Fig. 2. Matched metal die molding and 200-ton hydraulic press produce swivel bases for office chairs.

and housings on Gisholt's machine tools led to setting up the department. It now supplies Masterglas plastic products (Fig. 1) to other industrial equipment and consumer goods manufacturers, as well as to Gisholt.

The department features facilities for the design and production of fiberglass reinforced products, ranging from prototypes to component parts and completed assemblies. Fabrication is done by two methods —compression molding and hand lay-up.

Fig. 3. A mold is disassembled to remove a cured, hand laid-up part.

Matched metal die molds are used for large production runs. Pre-mixed material is placed in the molds, and heat and pressure are applied with heavy-duty hydraulic presses (Fig. 2), to produce the final shapes. This method, requiring permanent tooling, results in a good finish on both sides of the plastic part, high density of parts, and low cost per unit.

The contact or hand lay-up method of molding is used for economical and quick production of parts in small lots (Fig. 3).

In this method, a gel coating is applied to the mold to give the part's surface a homogeneous appearance. When the coating is cured, several layers of fiberglass matting are laid in the mold. Plastic resin is then poured into it, and a plug is put into the cavity and forced down to stops by clamps. The mold is left this way until the plastic is cured.

By varying the amount of fiberglass matting used, the strength can be changed to meet varying requirements. After the cured part is removed from the mold, it's relatively easy to trim the flash (Fig. 4), and paint the finished part. end

Fig. 4. Flash is easily trimmed from a cured part.

# A DILEMMA OF GROUP RESEARCH— DETERMINATION OF 'INVENTORSHIP'

THE PATENT LAWS ARE EXPLICIT in requiring that an application be filed in the name of the inventor, or inventors, whose contribution to the arts or sciences is represented by the invention.

Pursuant to these laws, the courts will normally find a patent to be invalid where there has been a misjoinder of inventors — that is, designating the wrong inventor or the wrong combination of inventors. The law and the courts are consistent in requiring a patent to be granted only to that person who has "exercised an inventive faculty" (exercised more than routine skill) or to those persons who have together exercised such faculties to create the subject of the patent grant. Thus, the potential penalty for an error in the matter of *inventorship* is complete and total loss of the property right represented by the patent. Where the fact of misjoinder of inventors can be proven, the patent is invalid notwithstanding the absence of fraud or the intent of the parties to act in good faith.

The facts relating to inventorship may be obscured, overlooked, or ignored where, as in a corporation, a number of persons work together to achieve a desired result. Frequently the attainment of the result is of much more immediate importance to the parties than which of them contributed the inventive concept involved. Whatever the motivation, however, an error in the matter of inventorship potentially foredooms the patent grant.

Accordingly, it will be well to touch on some of the more salient considerations regarding sole or joint inventorship.

Unfortunately, there are no exact rules by which the matter of inventorship can be determined where a cooperative effort has produced an invention. While exact rules are absent, there are both negative and positive guide posts which can be used to indicate conditions under which sole or joint inventions have taken place.

First, consider the case where there has been a group assignment to solve a particular problem or to achieve a given result. If the conception for achieving the desired result and the means whereby such result is achieved represents the contributions of one person, it is clear that a sole invention has taken place.

The developmental stage at which the "inventive faculty" may be exercised is unpredictable, and whether early or late has no effect on the fact of inventorship. The mere isolation of a problem may constitute the invention. This may be illustrated by a situation in which considerable trouble was experienced in the operation of a compressor under certain operating conditions. The inventor, in this case, analyzed the problem and traced it to a failure to vent properly a particular portion of the compressor system. Thereafter, a co-worker performed the routine of designing the vent. It is clear that a sole invention was made in the discovery of the cause of the problem.

*by Richard P. Barnard*
**Patent Section**
**Central Office Staff**
**GENERAL MOTORS CORP.**
**Detroit, Michigan**

On the other hand, the efforts of many people working in concert may be brought to fruition by the insertion of the inventive key by one of their number after the others have provided all but the missing element. Under these circumstances, a sole invention may again result.

**Joint Contributions Need Not Be Equal**

The greatest difficulty arises in the case where there appears to have been a joint invention. In this case it is necessary to appraise the contributions of several parties to ascertain whether one or several supplied that quantum necessary to constitute invention. First, it is not necessary that the contributions of joint inventors be equal either quantitatively or qualitatively. In fact, it is possible that one inventor may have made a relatively minor contribution and still be considered a joint inventor. Here again, it is necessary to advert to the standard of the "exercise of inventive faculties." While recognizing that invention is something more than the exercise of ordinary skill in a particular art, one may exercise his inventive faculty to a greater degree than another in creating what may be properly considered a joint invention.

**Technical Inability Not Penalized**

Joint inventors need not contribute in the same way to a common invention. One party might conceive the solution to a problem and another the means for implementing the solution. It is still, however, a joint invention. The fact that one party had no part in the actual construction of a machine has been held not to negate joint invention. An extension of this illustration is the case of a party having an idea but not being technically or scientifically equipped to express his idea in a workable form. This party, therefore, collaborates with a technician or a scientist who gives physical or practical expression to the nascent idea. Depending on the extent of the contribution of the technician or scientist, either a sole or joint invention may take place.

Certain recurring misconceptions suggest additional guide posts to be staked out along the path leading to a correct determination of inventorship.

**Status of Supervisor**

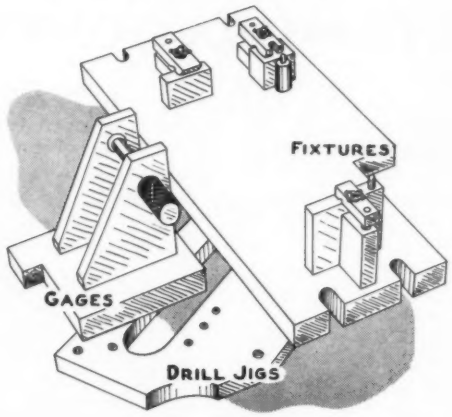
A supervisory status does not, for that reason alone, entitle one to preempt entirely or even to share as co-inventor of a subordinate's invention. Further, assignment of a problem for solution does not constitute one an inventor unless the problem is presented in a way to make the solution obvious to one skilled in the art. On the other hand, it is no less an error for the creative supervisor, out of a misplaced sense of modesty or loyalty, to credit his invention, in whole or in part, to a subordinate. The preceding observations are particularly likely to plague the individual responsible for directing the research or developmental efforts of other individuals.

**Conclusion**

Commercial exploitation of a patented invention is normally undertaken with the assumed assurance that others may be excluded from practicing the invention for a limited period. Capital investment frequently makes this assurance a necessity. To prematurely lose this constitutionally provided assurance, as may happen through an improper determination of inventorship, may result in economic loss. end

From: General Motors Engineering Journal. Permission to reprint is gratefully acknowledged. —E. W. P. Editor

# ALUMINUM TOOLING




## . . . its place in Industry

THE USE OF ALUMINUM TOOLING plate (rolled) and aluminum tooling-and-jig plate (cast) has been catching on; our numerous talks to users and suppliers justify this statement.

Exact figures are not available as to the percentage of jig and fixture work that makes use of aluminum. However, a number of chief tool engineers have offered these comments:

"There has been an increase of probably 10%/yr, from one year to the next, in the use of aluminum tooling for the last few years," says one tool executive. "This seems to be especially evident in some of the new progressive production shops supplying hardware to the automobile and appliance manufacturers. A fair percentage of this fixturing is for gaging. And in instances where jig size or shape preclude the use of all-aluminum construction, steel reinforcement can be used."

"The size and shape of any tooling," he added, "dictates the design as well as the material to be used. There are, I think, many more tooling applications where aluminum could be used than the average designer realizes."

The fact that a number of the people we talked to were not aware of the difference between rolled and cast aluminum tells us, as editors, that there is much education needed concerning its use.

Briefly, rolled aluminum can be compared to rolled steel. Rolling increases the physicals, so rolled aluminum has better physical qualities than cast aluminum. On the other hand, cast aluminum is very stable, as is cast iron (or steel). It was our surprise over finding that general information such as this is not widely known that prompted this writing.

None of the many companies we talked to stocked aluminum, another deterrent to its use. Although the supply houses are numerous and offer excellent service, aluminum would probably enjoy a more varied use if "on hand" as steel usually is.

The use of aluminum for large jigs (those that have to be handled by lift truck or crane) is out since stability needed for close tolerances is not yet possible. Welding too is more difficult with aluminum, and the larger a fixture gets the more likely it is to be a candidate for welding. Smaller fixtures can be bolted together without setting up stresses.

A supplier of aluminum tooling and jig plate, when queried as to who his big purchasers were, had this to say: "We have no large buyers, but we supply myriads of small subcontractor-job-shops. These small buyers furnish tools to the big and little producers of automobiles, appliances, aircraft and missiles — industries which make but a small part of their own tooling."

"Our use of aluminum in the construction of jigs and fixtures is primarily for the purpose of saving weight in holding fixtures for assembly work," says one Thompson Ramo Wooldridge executive. "We apply aluminum to fixtures, where applicable, to make them easier to handle — tumble assembly jigs, for instance, where components are integrated from all sides. Here the operator must either move the jig to approach it from various angles or walk around it." He added:

"The cost of material should not be a factor in the choice of jig and fixture materials used. The tool should be made from materials that will do the job. So, although aluminum may cost twice as much, taking into consideration the aluminum to steel weight differential, this can add very little to the price of fixtures. Whatever it adds can often be recouped from ease of handling during build, let alone production savings during its use.

"It is difficult to put a finger on figures concerning the percent of increase of aluminum use over the last 10 yrs. The reason for this is the increase in the number of users competing with us. I would venture to say, however, it has doubled or tripled. *Our* use of aluminum rolled and cast has gone up perhaps 25%."

A chief tool engineer of one of Ingersoll Rands' facilities says, "We have a more or less standing rule when we design tools. Consider aluminum and use it wherever possible. Although we have just started to put this thinking into practice, and don't know to what extent it will go, we know there is a place for aluminum in our tooling."

For your consideration, while more case histories are being compiled for publication in future issues: Aluminum tooling plate comes with an as-rolled finish that may or may not have to be machined, depending on application. One supplier furnishes it in thicknesses of from ⅜″ to 3″, widths up to 84″ and lengths up to 240″. Flatness varies as to size; for example, in 1″ to 3″ thick stock a typical flatness is within 0.020″ for every 24″. Thickness tolerance for the ⅜″ to ¾″ range is ±0.010″. Tensile minimum is 42,000; yield minimum 35,000; and elongation is 6-10%.

The aluminum tool and jig plate, as a cast material, has much closer tolerances and enjoys good stability characteristics. It comes in large sizes too, ⅜″ to 6″ thick, 48″ wide, and up to 144″ long. Flatness here is good; in fact, it's much better than in rolled aluminum, since the cast plate is machined to a 20-35 microinch finish (all over). Flatness is within 0.005″ under a 4′ straight edge for the 1″ thickness range. Typical thickness tolerance is ±0.007 variation from parallel. Tensile is low, 25,000 typical. It is not intended to be used where yield is expected to be a design factor but do use it where its stability needs to be depended upon.

— W. E. H.

# METHODS IMPROVEMENTS REDUCE PRODUCTION COST OF POLE PIECES

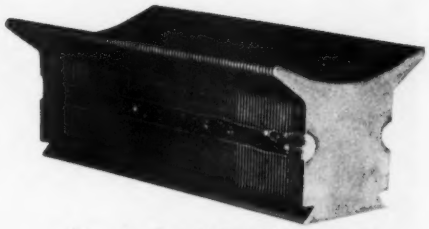


Fig. 1. Completed piece shows shape of a typical pole piece. The smooth, clean beads require no grinding, chipping or brushing.

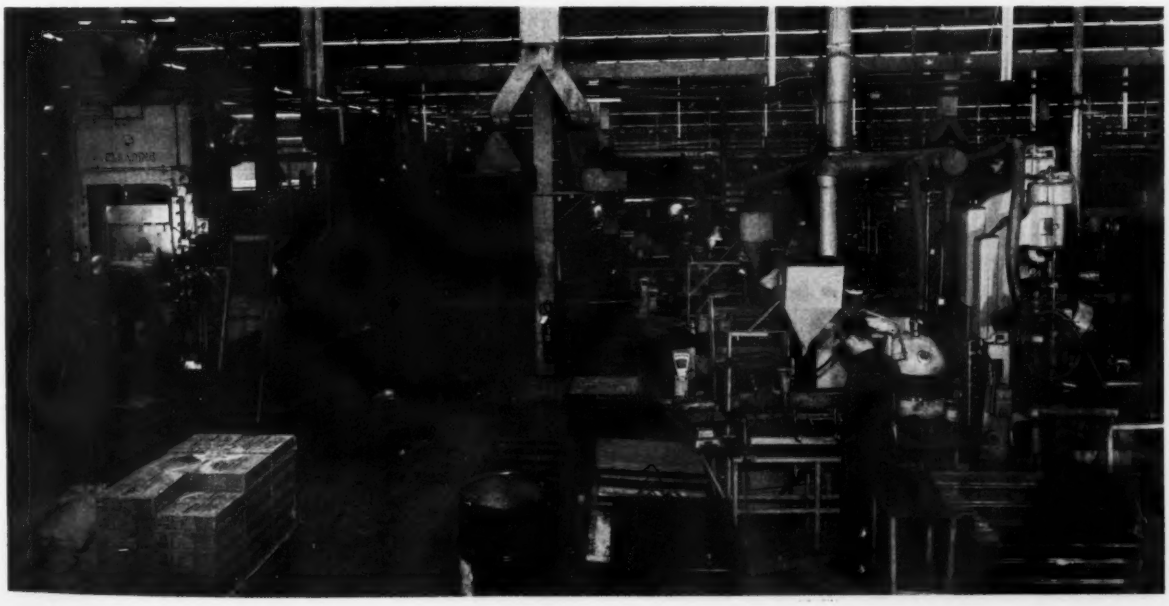
OVER THE YEARS, The Lincoln Electric Company, Cleveland, Ohio, has manufactured many thousands motor-generator welding machines. Each machine has eight laminated steel pole pieces around which coils are wound. The volume of work is such that savings per part produced by improved methods accrue to a substantial sum when totaled for an entire year's production. Two major changes have reduced costs.

Lincoln's pole pieces were originally assembled and held together with rivets. The rivets ran through the entire stack of laminations and held them firmly together. Each pole piece was individually weighed, stacked, assembled, and riveted. The resulting pieces were satisfactory from a functional standpoint, but expensive by today's standards.

A tie-bar design replaced the riveted pole pieces. This style pole piece had a rectangular notch running the length of the pole piece on each side. A tie-bar fit in the slot and was welded at either end to the lamination stack. This design reduced material costs because there was less material in the tie-bar than in the rivets and also because it improved the electrical efficiency of the iron in the pole piece by removing the rivet holes. Also, the tie-bar design permitted much simpler tooling than had been necessary with the riveted design.

Despite these savings, the tie-bar design had certain restrictions that paved the way for the next improvement. In the first place, it was still necessary to handle each pole piece individually. The operation still involved separate weighing, assembling and manual welding of each pole piece. Also, because the tie-bar was welded only at the ends, it was necessary to use a fairly heavy bar and to press fit it into the groove to prevent twisting. It also was necessary to handle each pole piece to grind down the weld and remove spatter so that no rough edges protruded high enough to pierce the coil. The latest design eliminates these conditions. . . . continued next page

Fig. 2. Lincoln's entire pole piece manufacture is in one small area. Automatic press punches laminations; three semi-automatic welders join them; then, completed pole pieces go to the various assembly lines. Welded pole pieces reduced labor costs by about half as compared with previous methods.



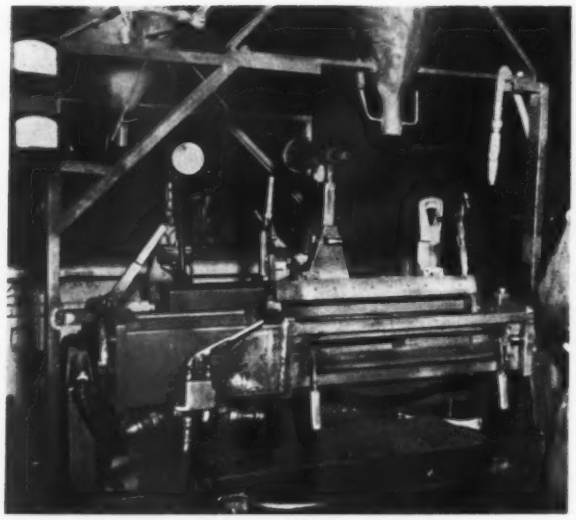


Fig. 3. This tooling converts the semi-automatic unit to virtually fully automatic operation. The gun is shown raised for loading the fixture. When the gun is flipped down to welding position, a plug at the bottom engages a continuously moving chain which "travels" the gun while making the weld. Contact of the electrode with pole piece starts the arc.

Fig. 4. View shows the first of two pole pieces in the fixture with a copper separator. When the second set is placed, the fixture is closed and clamped. An air ram holds the laminations tightly together during welding. Grounding of the laminations is through a braided copper strip clamped the entire length of the fixture. A flux storage hopper is mounted above.

Lincoln's pole pieces are now welded with a single, continuous semi-automatic bead on each side running the entire length. The rectangular notch which held the tie-bar was replaced with a semi-circular notch that is completely filled with the weld metal bead. Because each individual lamination is firmly welded to adjacent laminations in the stack, the weld bead can be much smaller than the tie-bar. Material costs are actually slightly less than with the previous design, even though weld metal is substituted for bar stock.

The new welded design cut labor costs almost in half. Now the operator places from two to ten pole pieces in the fixture at one time. Each pole piece is separated by copper spacers. A semi-automatic Lincoln-weld submerged arc welder makes one pass over the entire group of assembled pieces and welds them all at one time. The fixture is rotated 180 degrees and a single pass is put in on the other side of the pieces. The operator weighs the next group of pole pieces during the weld ing cycle. The resulting beads are smooth and clean, eliminating completely the grinding operation.

Lincoln has three pole piece welding stations. Each station has an identical scale and table type fixture and is capable of welding the entire range of pole piece sizes manufactured. The stations stand side-by-side and are located next to an automatic Clearing press that stamps out the laminations. No cleaning or degreasing is required before the laminations are welded. The drill press used to drill the holes required for final assembly of the pieces into a generator frame stands beside the welding stations.

The arrangement provides maximum flexibility in scheduling production and minimum handling between stations. Material starts as a coil of electrical steel, goes through the press, is assembled, welded and drilled all in about 40' of floor space. The new design and manufacturing setup, while reducing costs, also strengthened the pole pieces and improved working conditions by converting to submerged arc from manual arc welding. end

Fig. 5. After the trunnion mounted fixture is closed and locked, it is rotated 90°. The gun is swung down and all pieces are welded with one pass. The fixture is rotated 180° and the second weld is made. The operator weighs the next sets of laminations while the welds are being made.

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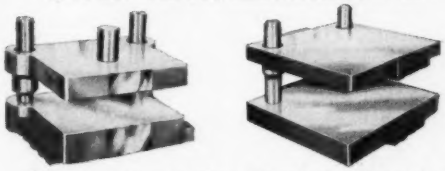

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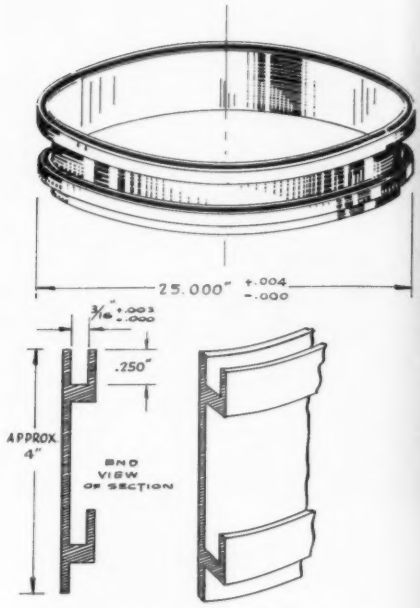
CIRCLE INFORM-A-GRAM KEY NO. 61

# CHOOSING THE LUBRICANT FOR CARBIDES




*by John A. Boyd*
**Vice President**
**VAN STRAATEN CHEMICAL COMPANY**
**Chicago, Illinois**

"USE WATER SOLUBLE LUBRICANTS on carbide tools" is a general rule that is keeping a lot of companies from obtaining maximum tool life and the lowest possible cost.

The rule should read, "The selection of a tool lubricant depends on the metal being machined, the cutting speed, tool design, and the operation being performed."

Following this rule, you will find that carbide cutting tools will sometimes require straight oils and sometimes water soluble lubricants.

The reason no clear-cut, universal answer applies to the selection of a tool lubricant lies in the fact that a tool lubricant performs its function of increasing tool life through two different means:

1. By providing lubrication that reduces the amount of friction and the resulting heat in the operation, thus decreasing tool wear.

2. By dissipating the heat formed in the operation and thereby increasing tool life by lowering the tool temperature.

In carrying out these two functions we find that water soluble lubricants will dissipate heat better than straight oil lubricants, but the straight oil lubricant offers the best lubricating film. As a result, to find the correct lubricant to be used on a given operation we must determine the balance needed between lubrication and cooling and then select the lubricant that provides this balance.

One excellent guide in judging whether we need lubrication or cooling in an operation is the cutting speed. At higher machining speeds lubrication is not as important as good heat dissipation, and we find water soluble lubricants far outperforming straight oils. When carbide tools were first introduced, the higher speeds used made it necessary to change from straight oils to water soluble lubricants. This led a number of observers to the conclusion that water soluble lubricants would always be better with carbide tools and "they" arrived at the poor rule mentioned above.

While speed is one part of the analysis in selecting tool lubricants, the metal being machined is also highly important. The high strength, heat-resistant alloys, for example, are extremely difficult to machine. Straight oils will generally outperform water soluble lubricants on these alloys. The abrasiveness and the tendency of these alloys to weld to the tool usually require straight oil lubrication to give maximum performance with carbide tools.

Another factor is the design of the tool. Check to see whether the tool has relief on all edges. On some form tools it is impossible to provide side relief without greatly reducing the number of regrinds possible, from them. As a result of not having adequate side relief, these form tools have a rubbing contact with the work that creates a condition where lubrication by straight oils is more important than cooling by water solubles.

The operation itself can also provide a clue as to whether a straight oil or a water soluble lubricant should be used. On certain recessed cuts it is almost impossible to provide a full direct flow of coolant. In these cases we depend on the splashing or the carry-in of the lubricant, and favor straight oils.

In analyzing a cutting operation, some of the factors mentioned will call for water soluble lubricants and others will indicate straight oils. Under these conflicting conditions the only satisfactory answer can be found by trying either a straight oil or a "water soluble," or both.

Fortunately, the trend in lubricant technology has been toward a broadening of the properties of tool lubricants. For instance, "water solubles" have been developed that in many cases approach the lubricating characteristics of straight oils. Similarly, by improving the wetting and heat exchange characteristics of straight oils, it is now possible to use straight oils on many high speed operations where "water solubles" were once preferred.

One plant was using carbide tools at 450 sfpm, with a water soluble lubricant, on a Bullard vertical lathe. They were cutting a 25" dia ring of AMS 5651 steel with 27-30 Rockwell C hardness. With a feed of 0.005", the stock removal was between 0.010" and 0.025" on the inside. In cutting the groove with a water soluble or aqueous based lubricant they eked out one, sometimes two, pieces per tool.

The "water soluble" was not the answer because these factors in the operation required the lubrication that can be achieved with a straight oil. AMS 5651 is a 25 Cr-20 Ni heat resistant alloy and alloys of this type require the lubrication produced by an oil; and in a grooving cut, side rub occurs creating a condition that requires good lubrication.

The lubricant was changed to an oil compound, with extremely good heat exchange characteristics and chemically balanced to handle the heat resistant alloys. The result: Increased tool life—from two pieces per tool up to 24 per tool—with excellent finish. end

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CIRCLE INFORM-A-GRAM KEY NO. 63

# DON'T WASTE $$$ IN YOUR

## Brunken and Goodwin cut tool life to 19 minutes . . . and doubled this machine's output

Here is one example of improved profits made possible by sacrificing tool life to gain *top machine efficiency* and lower cost-per-piece.

At Brunken and Goodwin Tool and Engineering Company, Maywood, Illinois, a closely recorded test showed that the same operator, using identical equipment and tooling could produce over two times as much with a $2.63 reduction in cost-per-piece.

In the test set-up a 20hp Monarch Lathe was used to turn a piece of 8620 steel, 280 Brinell hardness, to 5″ outside diameter. For the ⅛″ depth of cut, Kennametal Grade K7H turnover type (throw-away) inserts with 6 edges were used throughout.

As shown in the table at right, this company reduced tool life from 120 minutes to 19 minutes. Tool insert costs thus increased from $1.18 per day to $7.45. But this expense means relatively nothing because production soared from 13 to 30 pieces per day—reducing cost-per-piece from $5.01 to $2.38—*a 48% decrease.*

Your Kennametal Carbide Engineer will gladly show you results from other actual tests. Ask him for more information on how you can trade pennies in tool costs for dollars gained from top machine output . . . or write KENNAMETAL INC., Latrobe, Pennsylvania.

| | Before | Now |
|---|---|---|
| Tool life per edge | 120 min. | 19 min. |
| Machine cost/8-hr. day | $64.00 | $64.00 |
| Tool cost/8-hr. day | $ 1.18 | $ 7.45 |
| Cost per 8-hr. day | $65.18 | $71.45 |
| Pieces per 8-hr. day | 13 | 30 |
| COST PER PIECE | $ 5.01 | $ 2.38 |

*Write for booklet "There's Profit in Retiring a Tradition."*

# MACHINE OUTPUT TO SAVE ¢¢¢ IN LONGER TOOL LIFE!

There are hundreds of machine shops in the Nation today that could DOUBLE THEIR PRODUCTION OVERNIGHT, reducing costs and helping to relieve the squeeze on profits, by merely substituting a NEW IDEA in place of an old, traditional method they are now using.

All they have to do is to start operating their machines to get maximum OUTPUT . . . instead of operating them to get maximum TOOL LIFE. They are saving pennies through longer tool life . . . but they are wasting dollars in unused capacity of expensive machines, the unused talents of skilled operators and possibly in overtime costs to meet schedules.

This method of reducing costs by increased machine output is NOT an experiment. It doesn't call for you to be a guinea pig to try it. It has been PROVEN-IN-USE by dozens of progressive plants, and the results have been astounding.

Some of the dollars-and-cents results are recorded here. They can be duplicated in any plant that has good machines . . . and that is ready to challenge old ideas about tool life.

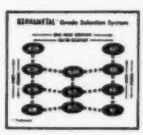
Just put yourself in the place of some of these successful users. Take a mental trial-balance, and estimate the savings you might make. Ask yourself this all-important question . . .

## Which pays off best . . . long tool life . . . or top machine output?

| Typical Examples—Same Machines . . . Same Tools . . . Same Workpieces | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Job No. 1 | | Job No. 2 | | Job No. 3 | | Job No. 4 | |
| | 240-Minute Tool Life Setup | 25-Minute Tool Life Setup | 75-Minute Tool Life Setup | 25-Minute Tool Life Setup | 120-Minute Tool Life Setup | 80-Minute Tool Life Setup | 120-Minute Tool Life Setup | 22-Minute Tool Life Setup |
| Machine Cost per Hour | $ 8.00 | $ 8.00 | $10.00 | $10.00 | $ 9.00 | $ 9.00 | $ 9.00 | $ 9.00 |
| Tool Cost per Hour | $ .04 | $ .40 | $ .36 | $ .76 | $ .14 | $ .215 | $ .14 | $ .77 |
| Cost per 8-Hour Shift | $64.32 | $67.20 | $82.88 | $86.08 | $73.12 | $73.72 | $73.12 | $78.16 |
| Pieces per Shift | 51 | 181 | 8 | 17 | 94 hrs./pc. | 41 hrs./pc. | 8 | 16 |
| **Cost per Piece** | **$ 1.26** | **$ .37** | **$10.36** | **$ 5.06** | **$859.16** | **$377.81** | **$ 9.14** | **$ 4.88** |
| Cost Reduction | 70% | | 51% | | 56% | | 47% | |

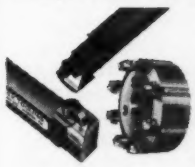
## TO MULTIPLY YOUR MACHINE OUTPUT...YOU NEED THREE THINGS:

**1. The "Three Man Tooling Team"** that utilizes the specialized knowledge of your Tool Engineer, your Machine Operator, and the Kennametal Carbide Engineer *. . . to determine the right tooling for each job.*



**2. The complete range of Kennametal* grades** that provides not only the exact properties needed, but assures the uniformity of quality that permits *accurate prediction of tool life.*

**3. Kendex* (patented) Tooling that provides instant insert change** without having to re-position the tool. This is the key to this new method . . . *frequent tool change without excessive down-time.*



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CIRCLE INFORM-A-GRAM KEY NO. 65

Fig. 1. Revolver thumb piece cast for 12¢. Shaft diameter was held to 0.003" total variation and secondary operations eliminated.

Fig. 2. Clarinet key, formerly assembled from five components, is produced as one unit from a nickel-silver alloy.

Fig. 3. Cylinder stop for revolver, cast in one operation, has 50-60 rms surface finish.

# TINY PARTS MASS PRODUCED BY PRECISION CASTING

*by J. H. Cadieux*
**Vice President**
**CASTING ENGINEERS, INC.**
**Chicago, Illinois**

Looking for a way to produce complexly shaped close tolerance miniature parts? This investment casting process can do it — fast and at low cost, too.

A NEW METHOD OF PRECISION FORMING, known as the Minicast process, has successfully combined the basic advantages of the investment casting process with those of other precision methods such as coining and cold forming. As a result, the process can compete with screw machines, die casting, and cold heading in the production of so-called "miniature" parts, less than one cubic inch in size.

Production rates of thousands of parts per hour, close tolerances, and elimination of secondary operations are cost-saving features of the process. A large variety of miniature parts with complex shapes can be produced from many alloys.

The parts are first formed as investment castings. In nearly every case these castings are merely precision shapes which are subsequently coined, cold-headed, or similarly processed to complete the final part. In contrast to ordinary investment casting, the parts can be produced at the rate of 25,000 to 50,000 per day (as opposed to 500 to 1,000 per day for conventional investment casting).

In the initial steps in the production of the miniature investment castings, plastic patterns are used instead of wax since they lend themselves to high production output with greater dimensional stability and uniformity. The patterns are molded in multiple cavity dies with as many as 20 parts produced in one injection shot. Once patterns are produced, other automated methods are employed for making the investment molds and for casting the alloys. After the precision shapes are produced, they are then coined or cold formed to meet any additional required specifications.

### Secondary Operations Reduced

Since the basic shape is produced by investment casting, a number of previously individually made components can be combined into a single part, thus eliminating not only the production of several parts but the cost of joining them together. The high production rates obtained with the Minicast process also lower the per-unit cost.

An example of typical cost savings is found in the part shown in Figure 1, which is produced with exceptional specification control for only 12 cents. The part, a thumb piece used as a component of an ejector latch on a revolver, is Minicast in chrome-nickel-moly steel. It was formerly manufactured as a forging requiring many secondary machining operations. Now, the shaft diameter and center location is held to 0.003" total variation, and secondary machining operations have been eliminated. In addition, the part was redesigned with an edge radius of 0.025".

As-cast tolerances on Minicast parts are normally held to ±0.005"/in, while some dimensions can be held to ±0.003"/in. These tolerances are, of course, typical of normal investment castings. However, when coined, cold formed, and similarly finished dimensional accuracy is improved. Thus, they can be held to ±0.003"/in. and some dimensions can be held to ±0.001"/in.

Parts of extreme complexity can be readily produced. The smallest cross section produced in commercial applications to date is 0.032" thick, but parts as thin as 0.020" have been produced experimentally.

### Many Alloys Used

As with basic investment castings, the Minicast process is particularly adaptable to difficult-to-machine materials since the close tolerances obtained reduce or eliminate machining requirements. Those alloys which are most suitable include high alloy steels, tool steels, so-called super-alloys, and stainless steels. In addition, low alloy steels can also be utilized. Of the non-ferrous metals, only magnesium alloy and the high zinc-copper alloys are not suitable, although the process has not yet been applied to such metals as titanium and zirconium.

Figure 2 is a key for a clarinet, formerly made from an assembly of five individual stampings and/or forgings. The part is now produced as one unit, in nickel silver for maximum corrosion resistance. This alloy was chosen because of its ductility, enabling the user to make minor adjustments after assembly. The material also provides a smooth surface finish which requires only buffing.

Finishes of 30-50 microinches are not uncommon on Minicast parts, depending on the alloy used. Typical of superior surface finishes is the part illustrated in Figure 3. This part, a cylinder stop used on a .22 cal revolver, is produced in a chrome-nickel-moly alloy. It has a uniform cast surface (50-60 rms), which insures freedom from burrs and machining irregularities.

The small spring hole is produced as a part of the basic operation, thereby eliminating drilling. Similarly, the bent shaft configuration is readily obtainable from the original casting operation without secondary operations. end

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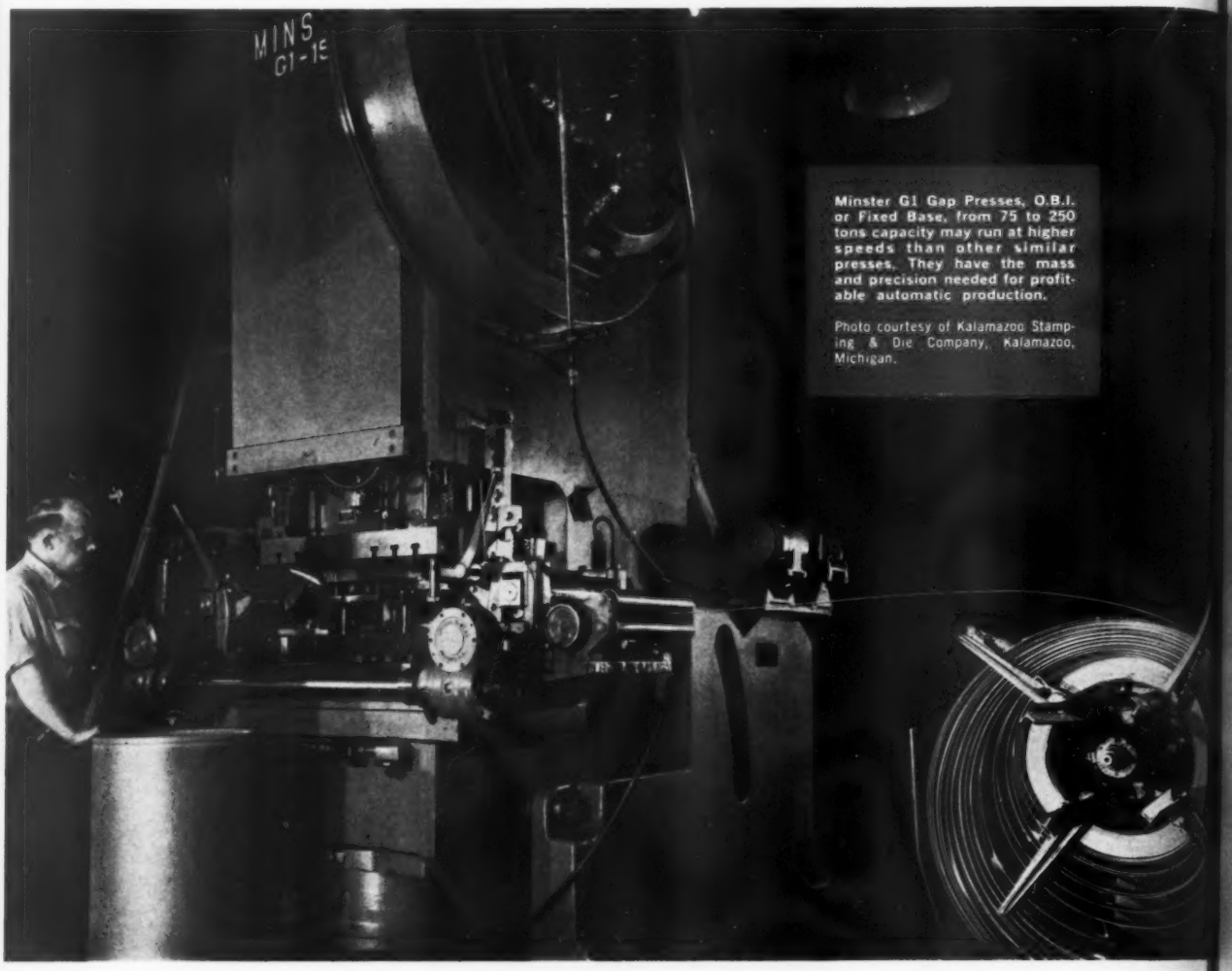
CIRCLE INFORM-A-GRAM KEY NO. 67

## Eliminate expensive secondary press operations with AUTOMATIC PRODUCTION




Minster G1 Gap Presses, O.B.I. or Fixed Base, from 75 to 250 tons capacity may run at higher speeds than other similar presses. They have the mass and precision needed for profitable automatic production.

Photo courtesy of Kalamazoo Stamping & Die Company, Kalamazoo, Michigan.

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Minster offers a full range of presses and feeds plus technical knowledge and assistance to help you take full advantage of automatic production. Take a close look at your unit costs, then write or call . . .

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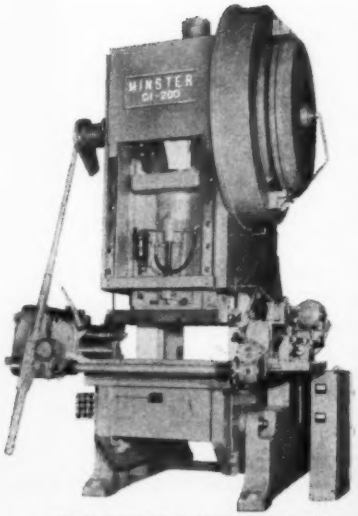


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| 3 | 21 | 42 | 109 | 752 | 884 | 953 | 1062 | 1173 |
| 4 | 22 | 61 | 110 | 781 | 885 | 961 | 1063 | 1174 |
| 5 | 23 | 63 | 111 | 782 | 886 | 962 | 1064 | 1175 |
| 6 | 24 | 65 | 113 | 791 | 887 | 971 | 1081 | 1176 |
| 7 | 27 | 67 | 115 | 792 | 901 | 972 | 1082 | 1181 |
| 8 | 28 | 68 | 120 | 821 | 911 | 973 | 1083 | 1182 |
| 9 | 29 | 69 | 121 | 822 | 912 | 991 | 1121 | 1183 |
| 10 | 30 | 72 | 127 | 831 | 913 | 992 | 1122 | 1184 |
| 11 | 31 | 73 | 128 | 832 | 921 | 993 | 1141 | 1185 |
| 12 | 32 | 76 | 701 | 833 | 922 | 1001 | 1142 | 1186 |
| 13 | 33 | 77 | 711 | 861 | 931 | 1002 | 1143 | 1241 |
| 14 | 34 | 80 | 712 | 862 | 932 | 1031 | 1144 | 1242 |
| 15 | 35 | 81 | 713 | 863 | 933 | 1032 | 1161 | 1243 |
| 16 | 36 | 85 | 714 | 871 | 934 | 1033 | 1162 | |
| 17 | 37 | 89 | 741 | 872 | 935 | 1051 | 1163 | |
| 18 | 38 | 98 | 742 | 881 | 941 | 1052 | 1164 | |
| 19 | 40 | 104 | 743 | 882 | 951 | 1053 | 1171 | |

EDITORIAL ITEMS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A1 | C2 | E5 | H6 | J8 | L3 | M15 | M33 |
| A2 | C3 | E6 | H7 | J9 | L4 | M16 | M34 |
| A3 | C4 | E7 | H8 | J10 | L5 | M17 | M35 |
| A4 | C5 | E8 | H9 | J11 | L6 | M18 | M36 |
| A5 | C6 | E9 | H10 | K1 | M1 | M19 | M37 |
| A6 | C7 | F1 | H11 | K2 | M2 | M20 | M38 |
| A7 | D1 | F2 | H12 | K3 | M3 | M21 | M39 |
| B1 | D2 | F3 | H13 | K4 | M4 | M22 | N1 |
| B2 | D3 | F4 | H14 | K5 | M5 | M23 | N2 |
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| B6 | D7 | G4 | J2 | K9 | M9 | M27 | N6 |
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| B8 | E1 | H2 | J4 | K11 | M11 | M29 | N8 |
| B9 | E2 | H3 | J5 | K12 | M12 | M30 | |
| B10 | E3 | H4 | J6 | L1 | M13 | M31 | |
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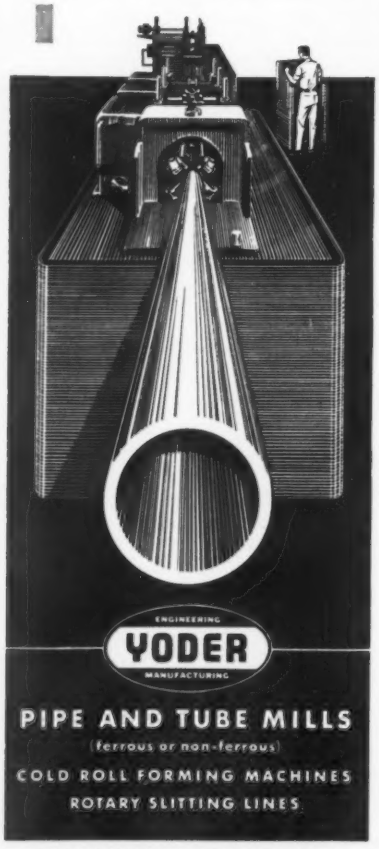


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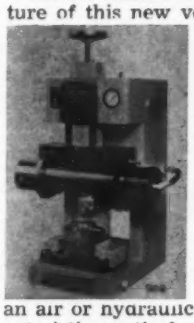
# Products & Processes

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

**All Pneumatic Operation** is a feature of this new versatile and compact bench model marking machine. Ideal for marking round, flat, or irregular pieces. It has features of larger floor models. Equipped with the Noblewest Duomatic air head, Model 509 is comparable to an air or hydraulic press with characteristic vertical ram travel, which provides marking pressure. It's controlled by air pressure pre-set at the regulator. Literature available from Noble & Westbrook Mfg. Co., Westbrook St., E. Hartford, 8, Conn., or Circle Inform-A-Gram No. A1.



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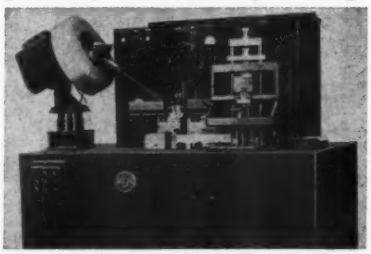
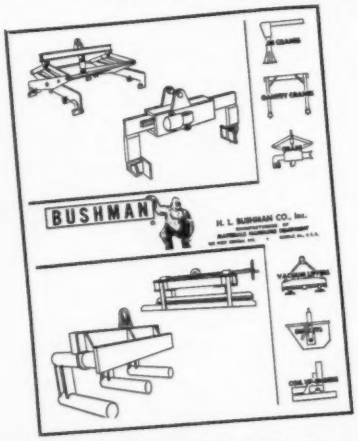


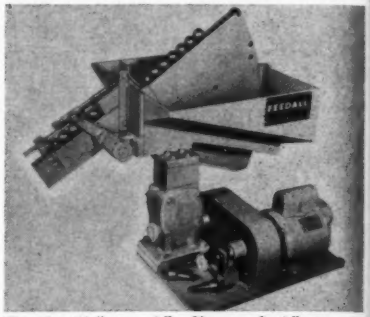
of part sizes handled. For Bulletin A.1080, contact Radio Corp. of America, Industrial Electronic & Automation Div'n, 12605 Arnold Ave., Detroit 39, or Circle No. A2.

**A Material Handling Equipment** catalog includes information on jib and gantry cranes, grabs, buckets, and coil up-enders. Specifications



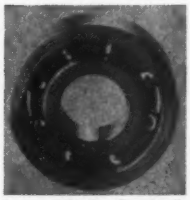

are given for all models. Write H. L. Bushman Co., Inc., Dept. TP, 100 W. Central Ave., Roselle, Ill., for a catalog, or Circle No. A3.

**Automatic and Continuous Feed,** transfer, and/or assembly of headed parts are provided by Model 700 feeder. Has electric control with variable speed from 10 to 20 spm.



Feeds ⅛" to 1" dia and 1" to 4" long sliding parts and ⅛" to 1" and ½" to 3" long headed work. Get details from Feedall, Inc., 38399 Pelton Rd., Willoughby, Ohio or Circle No. A4.

**Magnetic Tools** and individual magnets are presented in a catalog which discusses features and operation of various pieces of this type of equipment. Specifications on indicator holders, protractors, and magnetic blocks are given. Catalog 958 is available from Cullen Mfg. Co., 1603 Washington Ave., Racine, Wis., or Circle No. A5.



**Deep Groove Radial Bearings** for applications up to 900°F are listed in a bulletin from Industrial Tectonics, Inc., 3686 Jackson Rd., Ann Arbor, Mich. Included are high speed tool steel balls, races and machined retainers of snap-in type construction. Get copy from the company, or Circle Inform-A-Gram No. A6.

**A New Model Speed Vise** is outlined in a bulletin which lists features and explains operational highlights. Specifications for several models, with stationary and swivel bases, are given. Get Bulletin 61 from Cardinal Machine Co., Glendale, Calif., or Circle No. A7.

## WHERE TO FIND . . .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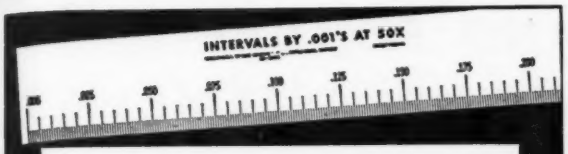


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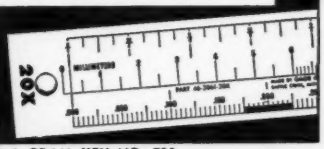


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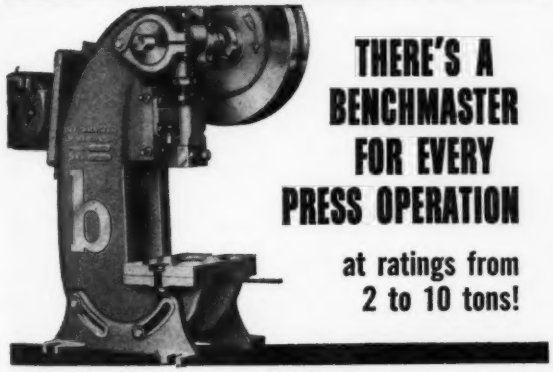

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213

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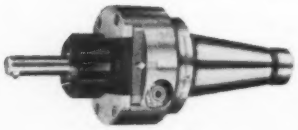
Standard Collet Chuck

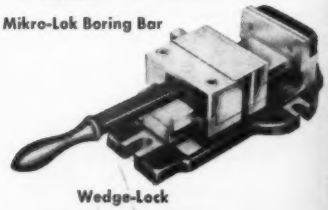
Mikro-Lok Boring Bar



Boring Chuck

"Kwik-Switch" Tool Holder

Standard Drill Bushing



Wedge-Lock Production Vise

**UNIVERSAL ENGINEERING COMPANY,** FRANKENMUTH 8, MICHIGAN

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# Inspection

PROCESSES & PRODUCTS & PROCESSES

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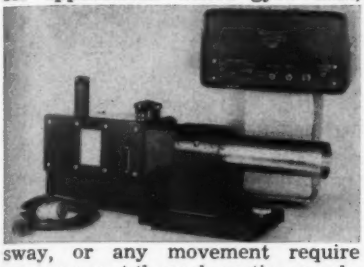

sway, or any movement require measurement through continuous observations over extended intervals of time. Davidson Mfg. Co., 2223 Ramona Blvd., W. Covina, Calif., or Circle No. B1.

**This Automatic Piston Pin Inspection Machine** is completely automatic and extremely reliable. It features speeds of up to 3000 pins/hr, and checks length, OD run-out, OD and taper, and segregates pins into ten categories. Catalog A.1076 is available from Radio Corp. of America, Industrial & Automation Div'n, 12605 Arnold Ave., Detroit 39, or Circle No. B2.

**Shop Calibration** of surface plates to 0.00001" is possible with the improved Planekator. Use to calibrate surface plates with greater accuracy and in less time than using lab-

oratory instruments. For details write Rahn Granite Surface Plate Co., 638 N. Western Ave., Dayton 7, Ohio, or Circle No. B3.

**Understage Illumination** for greater accuracy, versatility, and economy is a feature of the 10" optical comparator described in a bulletin from The DoAll Co., Des Plaines, Ill. Advantages, specifications, and operational instructions are described. Get a copy from the company, or Circle Inform-A-Gram No. B4.

**Large Sized Tie-Lock Plug Gages** are now available from Dundick Tool Works, Inc., 3410 W. 31st St., Chicago 23. The line consists of 251 individual go and no-go members in 0.001" increments with ±0.00007" tolerance and are precision ground and lapped and heat treated. Get information from the company, or Circle Inform-A-Gram No. B5.

**A New Gage Block Set** provides for the measurement of all standard snap ring grooves, O-ring grooves, and keyways. Handles direct measurement of fractional dimensions down to 1/64", measurement by thousandths from 0.020", and measurement by tenths from 0.120". Get details from The DoAll Co., Des Plaines, Ill., or Circle Inform-A-Gram No. B6.

**This Index Table** was designed for accuracy in small places and provides 360 positive locking positions. It's 6" x 5" x 1⅝" and used for measuring, inspecting, and machining. Calectron, Inc., 2444 Beverly Rd., St. Paul 4, Minn., or Circle Inform-A-Gram No. B7.


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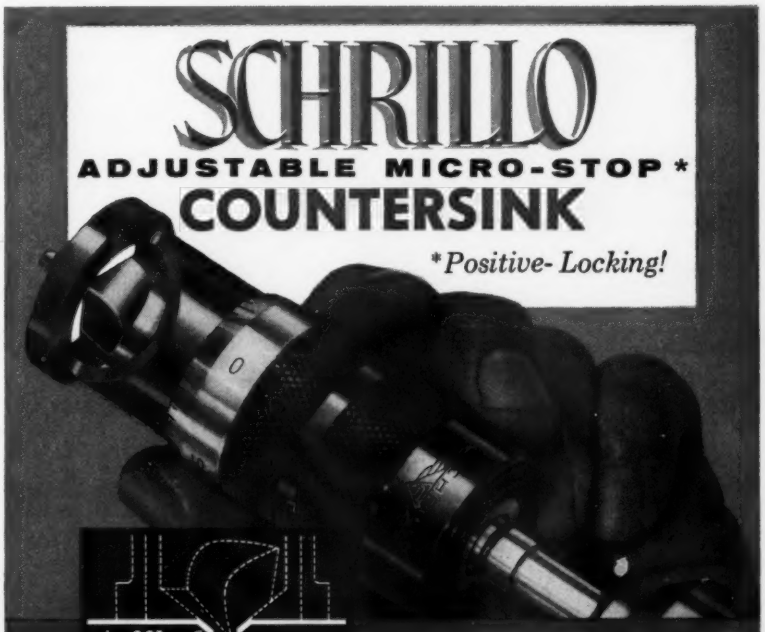


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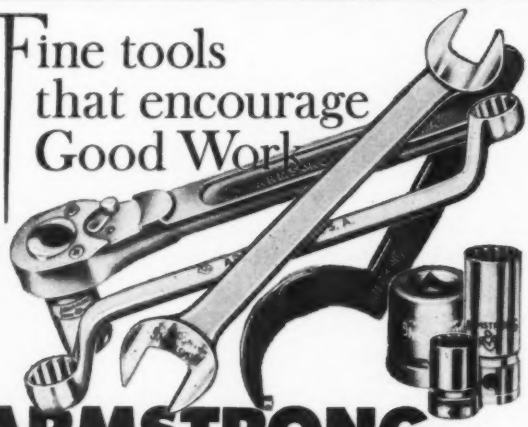

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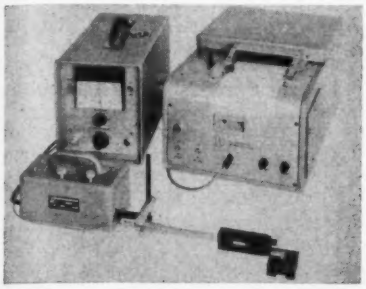
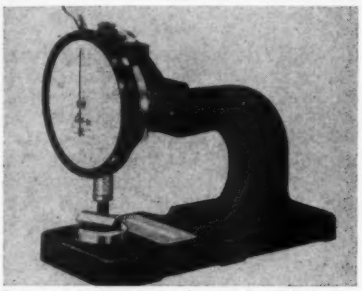
## Inspection

**Measure and Record Roughness Profile** of a surface with the Microcorder. This portable electro-mechanical instrument provides a permanent magnified chart of the



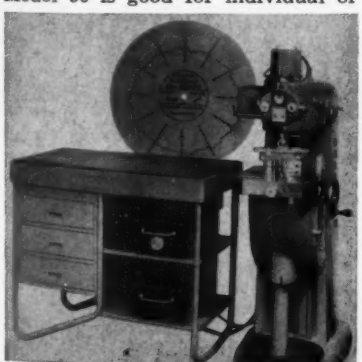
roughness profile of a surface. Bulletin is available from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., or Circle Inform-A-Gram No. B8.

**For Portable On-The-Spot Checking** in the shop, use the new lightweight comparator announced by Petz-Emery, Inc., Pleasant Valley, N.Y. Model B has cast aluminum



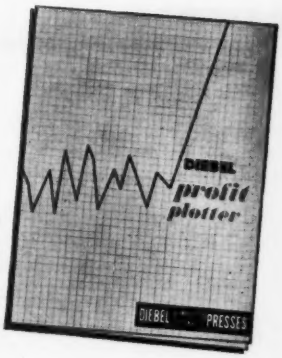
base and two countersunk holes for easy mounting. Measuring capacities are 0 to 1⅜", depending on size indicator used. Get details from company, or Circle Inform-A-Gram No. B9.

**A New Talyrond Roundness Measuring Instrument** provides accuracies of 0.000002" or better, over a range to 12" ID or OD and 10" high. Model 50 is good for individual or



production inspection of roundness in analysis and control of precision parts. Engis Equipment Co., 431 S. Dearborn, St., Chicago 5, or Circle Inform-A-Gram No. B10.


# Plot your way to BIGGER PROFITS

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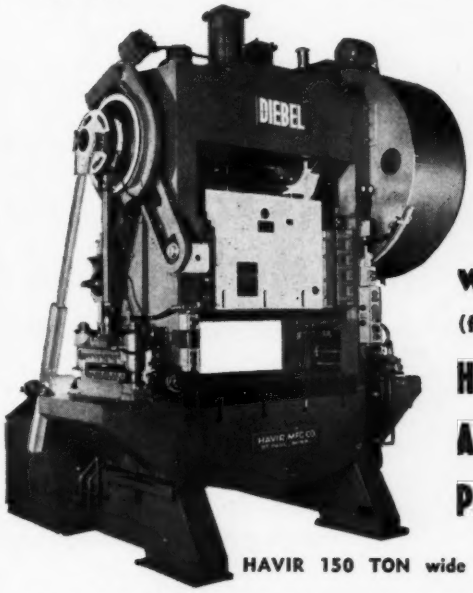


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Four post frame eliminates deflection, cylindrical type ram provides maximum bearing surface. You get more pieces per die sharpening, reduce unit costs to a minimum.

Models are available from 5 to 150 Tons with many optional features. HAVIR practical engineers can help you find the most efficient combination for your needs.

**Ask your HAVIR (formerly Diebel) Dealer or write for Bulletin D658.**

**PRESS-RITE DIV.**

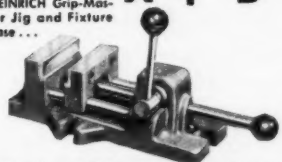
*Sales Service Mfg. Co.*

2361 UNIVERSITY AVENUE ST. PAUL 14C, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 751

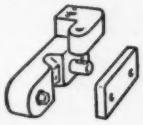
**A SIMPLE FORMULA TO CUT TOOLING COSTS UP TO 75%**

No need to start from scratch . . . use the HEINRICH Grip-Master Jig and Fixture base . . .



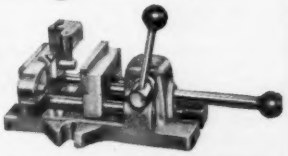
**A + B**

Simply add false jaws and bushing plate.



**= C**

Result . . . an accurate, low-cost Drill Jig.



Tool engineers from all over the country continually report savings to 75% with Heinrich's simple tooling formula.

The Grip-Master saves designing time, tooling time, costly tool steel and speeds production.

*Write for complete 28 page catalog.*

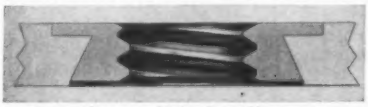
**HEINRICH TOOLS, Inc., Dept. 139-F, Racine, Wis.**

CIRCLE INFORM-A-GRAM KEY NO. 752

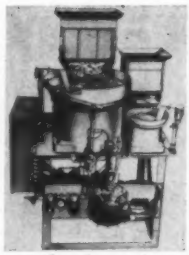
## Assembly

PRODUCTS & PROCESSES & PRODUCTS

**A New Self-Clinching Fastener** provides a flush mounting area on both sides of the sheet in which it's applied. Dropped into drilled or punched holes they're easily applied, one or several at a time, with



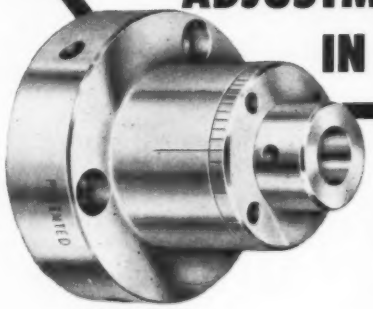
pneumatic or oil-hydraulic squeezer or mechanical press. Penn Engineering & Mfg. Corp., Doylestown, Pa., or Circle No. C1.



**New Automatic Assembly Machine** with push button control assembles 2400 pen tips and barrels an hour. Components are supplied to parts feeders from two hoppers and the supply is automatically controlled by bowl level switches in the parts feeders. Syntron Corp., 341 Lexington Ave., Homer City, Pa., or Circle Inform-A-Gram No. C2.


*Briney Precision Boring Heads Permit*

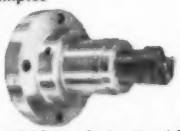
**ADJUSTMENTS TO TENTHS IN A FEW SECONDS**



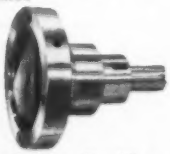
**No loosening or tightening of any screws required. Just rotate a graduated adjusting collar with a spanner wrench**

BRINEY

SIZE-POSITIVE BORING HEADS are also designed for special boring applications. Some examples



● Special Briney Boring Head for bottom facing and I.D boring with precision depth and bore control.



● Special Briney Head for automatic retraction and feed out.
● Miniaturized heads for cluster boring.
● Block-type tooling for precision boring and O.D. turning used on vertical or horizonal bed multi-purpose machines.

NOW, the patented Briney Principle incorporated into a new precision boring head design and construction gives you all-around savings never before possible. Initial set-up time is drastically reduced and only a few seconds is required to adjust a Briney head for operational tool wear. Scrappage is minimized.

The head is of built-up construction on pre-loaded balls to offer extreme tool rigidity, long life, easy and economical bar replacement. There are no parts to wear that could result in sloppy fits and difficult tool wear adjusting control after extended use. On the job tests indicate balls act as vibration dampeners and eliminate chatter Fine finishes are obtainable to eliminate many secondary operations.

Size-positive adjustments permit precision control over bore sizes. Very slight bar offset permits speeds up to 9000 rpm, minimizing out-of-balance operation. Manufactured from high quality tool steels and finish ground all over for balance controlling purposes. Every head, special or standard, is individually calibrated after assembly to assure size-positive adjusting control.

Six standard styles to fit most boring applications available off-the-shelf for quick delivery at prices you normally pay for ordinary boring heads.

*WRITE TODAY FOR CATALOG and see for yourself the savings you can realize from using Briney Precision Boring Heads*

**BRINEY MANUFACTURING CO.** 1165 SEBA ROAD PONTIAC, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 76


**Design Servo-Mechanism Gear Train Packages** from tips in a booklet, "Universal A to Z Design for Unlimited Package Assemblies." Details use of stock instrument plates and cluster gears for making assemblies. Get booklet from PIC Design Corp., 477 Atlantic Ave., E. Rockaway, L. I., N. Y., or Circle Inform-A-Gram No. C3.

**Convey Parts and Materials** quickly on production lines with integrated transfer systems made up of building block components. Conveyors from 2″ to 12″ wide can make up any length, and unit integral

conveyors 15″ to 30″ long carry parts from process area to main conveyor. Ask for handbook from Alden Systems Co., Alden Research Center, P.O. Box 125, Westboro, Mass., or Circle No. C4.

**A Fasteners Catalog** classifies machine screws, sheet metal screws, hexagon head cap screws, bolts, nuts, and rivets. Stainless steel as well as monel, silicon, bronze, brass, and aluminum types are given. Get a copy from Albany Products Co., Inc., 351 Connecticut Ave., S. Norwalk, Conn., or Circle Inform-A-Gram No. C5.

**Tighten Tiny Screws** without buckling delicate movement plates, shearing threads, or cramping pin gears with the Tiny Torque screwdriver. It measures from 0 to 0.3

in-oz torque or can be made to read from 0 to 0.6, 0.8, or 0.10 in-oz torque. Model 001 is available from Apco Mossberg Co., 1001 Lamb St., Attleboro, Mass., or Circle No. C6.

**New Russel Screw or Pin Driving Machines** for faster assembly are discussed in a bulletin from H & G Sales Corp., P.O. Box 1589, New Haven 6, Conn. Detailed operational data on the driving head is presented in addition to descriptions of various models and their dimensions. The company supplies copies, or Circle Inform-A-Gram No. C7.

# HERE IS YOUR "Invitation" TO JOIN THE LEMPCO DISTRIBUTOR ORGANIZATION

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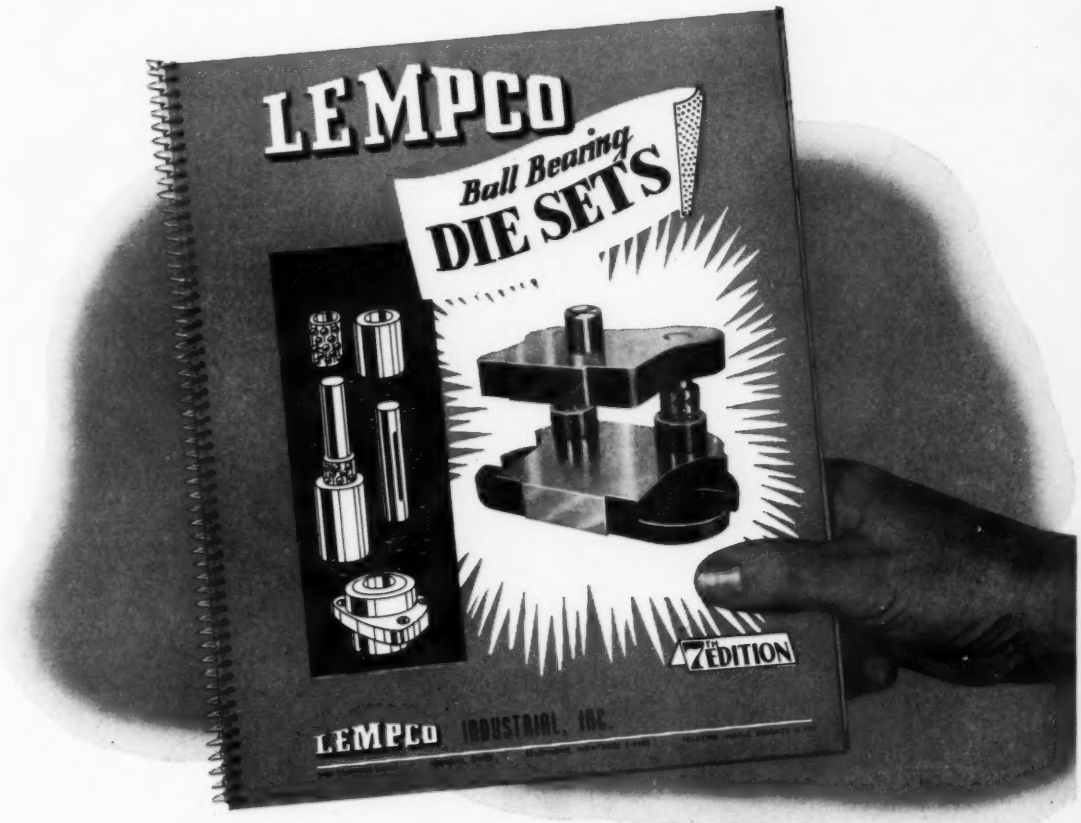


Because we are "specialists" in true high-precision die sets, the demand for our products continues to grow. We build **ONLY** BALL BEARING PRECISION DIE SETS, known throughout the Industry as the standard by which other lines must be judged.

Yet our quality product is priced competitively with old-fashioned "friction bearing" die sets, which means we are producing for the **whole market,** not just those who can "afford the best". Our line is complete, from smallest to largest sizes!

Due to the growing demand for Lempco Ball Bearing Precision Die Sets, we must have additional distributors to maintain our traditionally good Service to the Trade. Let us tell you what the Lempco distributor franchise can mean to **you** in the way of die set sales in your area. Write today for facts and figures!

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**FINE DIE SETS..... OUR ONE AND ONLY BUSINESS**

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Heavy-duty open-gap production presses with Hannifin hydraulic index tables...

*Available in all of these sizes:*

2, 3, 4, 5 and 6-ton bench models
6, 8, 10, 12 and 15-ton floor models

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Dual Safety Hand Lever Controls
Dual Electric Push-Button Controls
Adjustable Stroke Control
Reverse on Pressure or Distance
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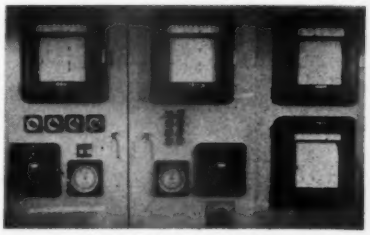
## Heat Treat

PRODUCTS & PROCESSES & PRODUCTS

**A New Electronic Device** that maintains tight, uniform time and temperature controls in modern heat treating furnaces has been announced by The A. F. Holden Co., 14341 Schaefer Hwy., Detroit 27. This "rationed heat energy" revolves around

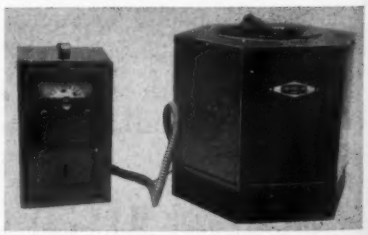


an electronic timer that can be preset at predetermined fixed points for both time and temperature through two phases of the heat treating process. Get details from the company, or Circle Inform-A-Gram No. D1.

**New Heat Transfer Units** are described in the Platecoil technical data manual which includes specifications and operational data on proper engineering and installation of the new Multi-Zone Platecoil. The 48-page manual gives descriptions of styles available and methods of calculating equipment requirements. Get a copy from Tranter Mfg., Inc., Platecoil Div'n, Lansing 9, Mich., or Circle Inform-A-Gram No. D2.

**Electric and Fuel Fired Heat Treating Furnaces** and protective atmosphere generators are presented in a 12-page bulletin. The Clean-Line automatic heat treat unit and shaker hearth, rotary hearth, conveyor, and pusher furnaces for continuous heat treating are described. Hevi-Duty Electric Co., Milwaukee 1, supplies Bulletin 653A, or Circle No. D3.

**This Rugged Multi-Purpose Electric Furnace** is especially useful for shops doing limited size parts or short run jobs of salt bath hardening, tempering, annealing, and silver



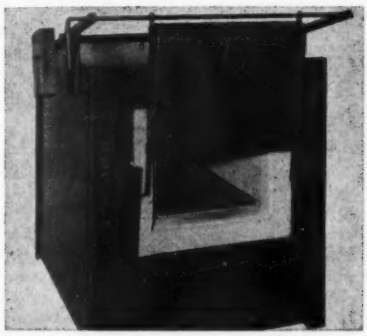
brass brazing. Type 2100 Thermolyne furnaces can be used as crucible furnaces or vertical muffle furnaces. Get Bulletin F-211 from Thermo Electric Mfg. Co., P.O. Box 697, Dubuque, Iowa, or Circle No. D4.

**Bell-Type Retort Covers** for vacuum or brazing furnace heat treating operations can be produced in any size, style, or alloy to meet specifications. Lifting lungs or eyes can

be welded to the cover bodies for easy handling. Write to Wiretex Mfg. Co., Inc., 40 Mason St., Bridgeport, Conn., for information, or Circle Inform-A-Gram No. D5.

**The Contro-Therm Process** of heat treating is outlined in a brochure that gives types of equipment used, and their capacities, ranges, and dimensions. Advantages and explanations of this type of heat treating are also included. Write to A. D. Alpine, Inc., 11837 Teale Ave., Culver City, Calif., for a copy, or Circle Inform-A-Gram No. D6.

**Two New Electric Heat Treating Furnaces** are designed for quality production and with a temperature range from 300°F to 2,000°F. Features multi-slab type insulation



with heavy sheet steel body and cast iron end frames. Cooley Electric Mfg. Corp., Dept. J-1, 38 S. Shelby St., Indianapolis 7, Ind., or Circle Inform-A-Gram No. D7.

**This Conveyor Heat Treating Furnace** is a compact production unit for alloying transistors and diodes, metal bonding and soldering, and other applications. Features, specifications, and heat control curves are included in a bulletin. Get Bulletin 5711B from C. I. Hayes, Inc., 826 Wellington Ave., Cranston 10, R. I., or Circle Inform-A-Gram No. D8.

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**U.S. SAVINGS BONDS**
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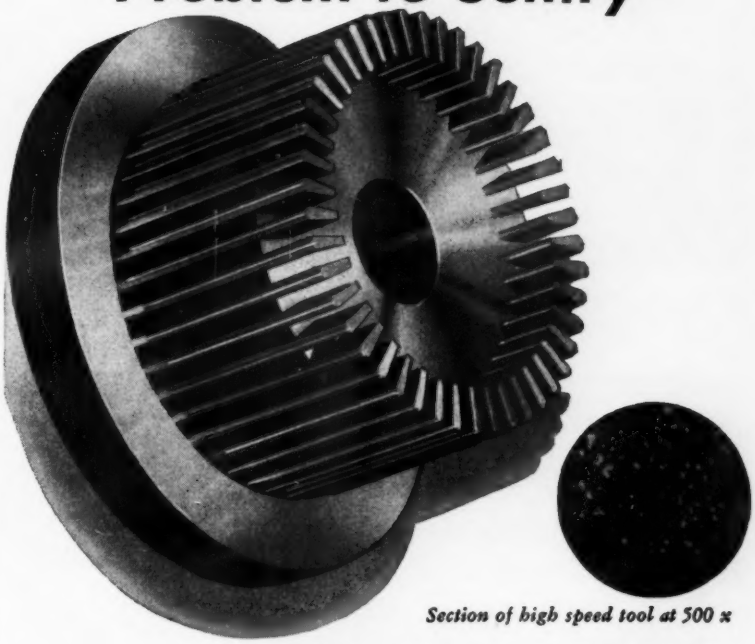
# Take Your Hardening Problem to Sentry



*Section of high speed tool at 500 x*

Critical tool hardening problems such as posed by the complex circular punch shown above are solved safely and surely the Sentry way. The Sentry Diamond Block atmosphere positively protects from scale or decarburization all steels hardening above 1700° F, permitting ample soak for true hardness without danger of surface spoilage. Even sharpest cutting edges are maintained.

*A demonstration hardening on your own tools will convince you of Sentry benefits. Why not send us samples?*

**Sentry** TRADEMARK **ELECTRIC FURNACES**

175-9

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**ADJUSTABLE**
**HOLLOW MILLS**

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- Area Sales engineers for your immediate Problems.

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## Management

**Automatically Make Large Size Prints,** up to 18″ x 24″, of engineering drawings from microfilm. The

Thermo-Fax 29 microfilm reader-printer produces prints in less than 15 sec. Write to Minnesota Mining and Mfg. Co., 900 Bush Ave., St. Paul 6, for details, or Circle Inform-A-Gram No. E1.

**"Vertical and Roll Filing Equipment"** describes different units and components for all types of filing jobs. Specifications, advantages, and tips on how to store drawings, single sheets, hard to file stencils and plates, and log items are included. Write to Plan Hold Corp., 5204 Chankemco St., S. Gate, Calif., for Catalog 4-59, or Circle Inform-A-Gram No. E2.


NOW...A *Carbide* CUT-OFF TOOL for EVERY Application . . .

The complete line of P.D.Q. (Portage Double Quick) Manchester cut-off tools includes tooling for all makes of Turret Lathes, Engine Lathes, Production Lathes, Automatics and Cutting-Off Machines.

This wide selection of carbide tools, designed specifically for each type of machine, offers real speed and economy in parting and grooving problems. Write for the illustrated catalog covering all the available standard types. Specials available on request.

PDQ

PORTAGE Double-Quick, Inc.

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**"Cost Cutting Management and Production Aids"** is a handbook that describes many components for factory layout. Power equipment, work centers, controls and connecting components, work transfer equipment, and stockroom aids are all indexed for convenience. Applications are also given. Write to Alden Systems Co., Alden Research Center, Westboro, Mass., for your copy, or Circle Inform-A-Gram No. E3.

**Control Artificial Light** with Alzak processed reflectors discussed in a booklet. Complete information on finishes, service, specifications, and performance, is given. Obtain Booklet 31-F-24 from Aluminum Corp. of America, 755 Alcoa Bldg., Pittsburgh 19, or Circle No. E4.

**"New Concepts in Practical Automation** and Electronic Computers" features the automatic keysort system for data processing, in which original records are used to achieve automation without transfer of data to other unit cards or tape. Explains operations and equipment available. Get a copy from Royal McBee Data Processing Div'n, Port Chester, N.Y., or Circle No. E5.

**"Making the Decision to Automate** Engineering Drawings" explains how automated drawings processing systems work, how they can simplify procedures and save space. A sample drawing of one system is included. The Filmsort Co., Pearl River, N.Y., supplies copies of this bulletin, or Circle Inform-A-Gram No. E6.

**Simplify Tool Crib Operations** with Kolect-A-Matic/Kard-Up/Kardex visual controls and equipment discussed in a bulletin. Features one simplified triplicate form for effective three-way control, with indexed pockets for easy filing of charge orders for fast, accurate control of all operations. Get bulletin from Remington Rand, Div'n of Sperry Rand Corp., 315 4th Ave., New York 10, or Circle Inform-A-Gram No. E7.

**"Control of Preventive Maintenance"** explains a three card system which provides flexible visual control and scheduling for maintenance of thousands of equipment items. The bulletin shows how this is done and how time and money is saved by using this system. Copies are available from VISIrecord, Inc., Copiague, L.I., N.Y., or Circle Inform-A-Gram No. E8.

**Movable Interior Walls** to control operating and maintenance costs and provide an inexpensive means to make little offices out of big ones are described in a bulletin. Features, specifications for many types, and applications are also given. Contact The E. F. Hauserman Co., 6800 Grant Ave., Cleveland 5, for Bulletin on Type HP, or Circle Inform-A-Gram No. E9.

JUST a turn of the end on the adjusting rod and the stroke of this versatile O-M Cylinder is lengthened or shortened to fit the operation. This is accomplished with micrometer accuracy in a moment from the outside of the cylinder without disassembling or unmounting the unit or extra parts. Thus, you get the advantage of a special cylinder with no additional cost.

OTHER ADVANTAGES. Fits where others won't. All-steel construction with bearing surfaces of bronze. Designed right to seal right. Rod has high yield point. Can be disassembled and assembled faster than tie-rod types. Delivers continuous, smooth, dependable power at low or high speeds. Port can be oriented to any position. End plugs are tapped for universal mounting.

*Available in a complete range of sizes (1½" to 8" bore) with standard, 2 to 1 or oversize rods. Also full line of mounting brackets interchangeable bore for bore. Immediate delivery on many sizes.*

**Mail coupon *TODAY* for Bulletin 112 featuring O-M Adjustable Stroke Air and Hydraulic Cylinders.**

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5 IMPORTANT ADVANTAGES
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## Plastics

PRODUCTS & PROCESSES & PRODUCTS

**A New Conductive Coating,** based on epoxy resins, has low volume resistivity, exceptional toughness, and excellent adhesion. Recommended for rebuilding areas worn away by

sliding contacts and as a conductive base for plating plastics. Hysol 6251 kits and literature available from Houghton Laboratories, Inc., Olean, N.Y., or Circle No. F1.

**"Preplasticizing Injection Molding Machines"** describes a new design concept in preplasticizing of plastics materials in injection molding and explains what this process is and its advantages. Specifications and applications are given. Write to the Hydraulic Press Mfg. Co., A Div'n of Koehring Co., Mt. Gilead, Ohio, for a copy of Bulletin 5831, or Circle No. F2.

**Low-Cost Experimental Vacuum Forming** of plastic materials is possible with this new portable vacuum molder. Test Vac 81 has 9" x 9" forming area, movable frame for straight or drape forming, and draws

to 4" depth. Hand operated model or one with an electric vacuum pump are available. Bulletin available from Plast-O-Craft, 503 McCarter Hwy., Newark, N.J., or F3.

**"Fiberglass Reinforced Plastics"** are the subject of a bulletin which explains a complete design, engineering, and production service for either complete products or components parts, produced by compression molding for large runs or hand lay-up process for small runs. Contact Gisholt Machine Co., Madison 10, Wis., for your copy, or Circle Inform-A-Gram No. F4.

## Materials

PROCESSES & PRODUCTS & PROCESSES

**A New Plastic-Lead Putty** can be formed into any shape without heat or pressure. Devcon L has high impact, compression, and tensile strengths and exhibits excellent resistance against most solvents, acids, and other chemicals. It can be ma-

chined after hardening and is non-shrinking and non-flammable. Devcon Corp., Danvers, Mass., or Circle No. G1.

**"Unionweld, Stainless Steel Pipe & Tube"** describes variations, including drawn tube with ID bead removed, and tolerances for pipe and tube standard products. Bulletin U is supplied by Union Steel Corp., 1550 Ashwood Terrace, Union, N.J., or Circle No. G2.

**"Swedish Cold Rolled Spring Steel"** is a 43-page spring steel stock list that contains all standard sizes, including band saw steel, tempered flapper valve steel, thickness gage steel, and annealed spring steel. Obtain your copy from Uddeholm Co. of America, 155 E. 44th St., New York 17, or Circle Inform-A-Gram No. G3.

**A New Copper Phosphorous Alloy** does not require flux or copper to copper joints. Phos Sil O can be used on copper, brass, bronze, and other alloys. It's an extremely ductile rod with very high corrosion resistance. Data sheet is available from American Brazing Alloys Co., P.O. Box 11, Pelham, N.Y., or Circle Inform-A-Gram No. G4.

**"Machining Aluminum,"** a 30-page handbook, provides complete data on machining practices, tool angles, and designs, and tool materials. Proper speeds, feeds, and cutting compounds are explained and eight charts cover eight major machining operations. Write on your company letterhead to Reynolds Metals Co., Dept. PRD-3, P.O. Box 2346-JN, Richmond 18, Va., for a copy.

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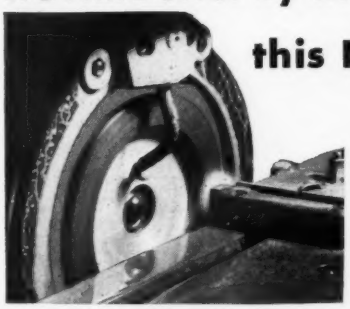

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## A.I.T. "E-2" Diamond Wheel for...

## ELECTROLYTIC GRINDING

The exclusive "E-2" bond in A.I.T. diamond wheels has been developed specifically to guarantee that you get the FULL VALUE out of Electrolytic grinding of carbides. We can prove this in YOUR plant, on YOUR grinders, with these results:

1. **Wheel pre-run to eliminate break-in time in YOUR plant.**
2. **Faster stock removal.**
3. **High peak removal for longer intervals**
4. **Longer wheel life.**
5. **Less corrosive action**
6. **Specially designed wheel to reduce weight and distribute electrolyte efficiently**

*Remember, to get these FULL VALUE results, be sure to send for complete test data today.*

101

A.I.T. Diamond Tool Co.

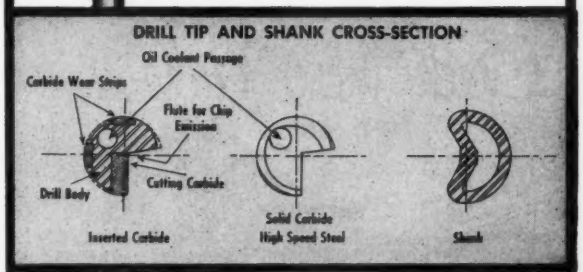
8217 N. KIMBALL AVE.
SKOKIE, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 832

# THIS DRILL ELIMINATES SECONDARY OPERATIONS

Just *one* pass with these high-speed steel or carbide-tipped gun drills produces an accurate, truly round, straight hole honed to mirror-bright finish. That's why you can drill small parts of all kinds — *faster, more accurately* and *at lower cost* with HI-STANDARD Gun Drills*.

Production parts that once had to be drilled individually can now be gang-nested and drilled through, producing holes identical in size, location and finish. Drilling of this kind is done on automatic indexing machines, lathes, horizontal and upright drilling machines, and similar equipment. Forced oil feed through the drill clears chips and cools cutting edge for faster drilling. No matter what the size or shape of your workpiece, drilling with HI-STANDARD Gun Drills is an



outstanding time-and-money saver. Any material that can be *machined*, can be *gun-drilled.*

Gun drilling is one important way in which forward-thinking manufacturers are increasing production and cutting costs. To find out how your company can do the same, write for your Hi-Standard Engineering File 20 *today!*

*Also called "deep-hole drills"

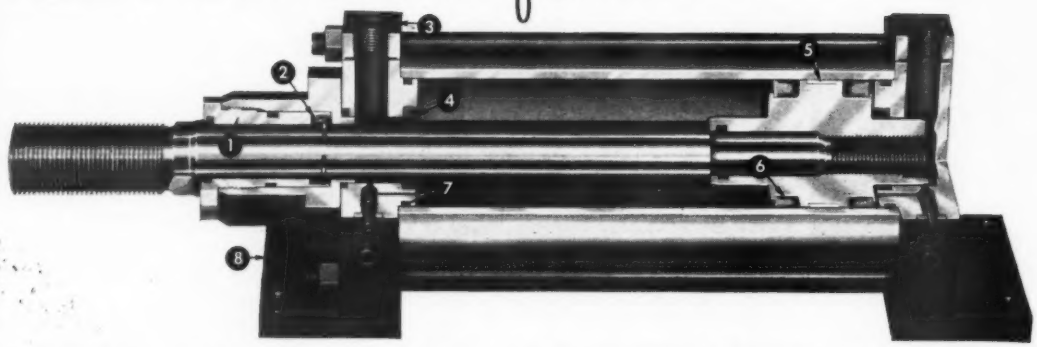
Pioneers in the Design and Development of Gun Drills for more than 30 Years

THE **HIGH STANDARD**
MANUFACTURING CORP.
HAMDEN • CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 833

# *Announcing* Valvair®

## *Check these Valvair features...*




1. **EXTRA-LONG NOSE GUIDE** provides maximum bearing area for piston rod . . . assures peak resistance to side-loading deflection of rod and piston.
2. **CARTRIDGE SEAL** assembly is designed for quick on-the-machine servicing . . . can be replaced without any disassembly of the cylinder.
3. **REMOVABLE PORT ADAPTERS** allow fast exchange of complete cylinder assemblies for bench servicing . . . time consuming piping operations are eliminated.
4. **SELF-ALIGNING CUSHION SEALS** assure uniform cushioning throughout cylinder life . . . unique one-way seal eliminates need for cushion ball check.
5. **TEFLON* WEAR STRIP** on piston prevents metal-to-metal contact between piston and bore . . . scuffing or scoring of bore surface cannot occur.
6. **NYLON-BACKED PISTON CUPS** for air service, or Teflon-backed O-rings for hydraulic applications, provide positive, bubble-tight sealing throughout the cylinder's operating pressure range . . . keeps break-loose pressures low.
7. **POSITIVE BARREL SEAL,** with full-width metal-to-metal contact between barrel and heads maintains leak-free sealing . . . holds dimensional stability under maximum stress.
8. **RE-USABLE MOUNTS,** with precision-fit load bearing slots, handle heaviest operating loads with ample safety factor . . . are easily changed for modification or re-use of cylinder.

*Trade name for duPont tetrafluoroethylene resin

8029

VALVAIR AIR & HYDRAULIC CYLINDERS SPEED KING CONTROL VALVES AND MANIFOLDS PLUG-IN CONTROL VALVES AND MANIFOLDS

# HEAVY-DUTY AIR AND HYDRAULIC CYLINDERS

200 psi air, 500 psi hydraulic
BUILT TO JIC STANDARDS

Here is a cylinder on which you can stake your reputation . . . built by Valvair, makers of famous SPEED KING control valves. With design features based on years of application engineering experience in high-production manufacturing operations, Valvair's new heavy-duty air and hydraulic cylinder offers performance, durability and ease of maintenance. Construction and component materials have been coordinated to assure efficient, trouble-free operation, plus longest service life with minimum machine downtime.

Built to JIC Standards and offering a full range of bore and rod sizes, interchangeable mounting styles, stroke lengths and cushioning options, you'll find Valvair heavy-duty cylinders ideal for your non-rotating cylinder applications. Take advantage of one-source responsibility for all your control system needs . . . cylinders, valves, manifolds, filters, regulators and lubricators . . . call in your nearby Valvair field engineer today.

For detailed information, write for Bulletin VC-800, Address Dept. TP659, Valvair Corporation, Akron 11, Ohio.

*Offices in principal cities.*

**Valvair** AKRON 11, OHIO

Other INDUSTRIAL DIVISIONS of IBEC The Sinclair-Collins Valve Co. The Bellows Co., Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio.

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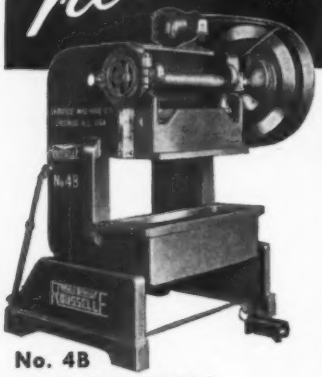
CIRCLE INFORM-A-GRAM KEY NO. 85

New 40-TON DOUBLE CRANK O. B. I.
ROUSSELLE



WITH NEW ELECTRICALLY CONTROLLED AIR CLUTCH

- "Plug-in" foot and hand controls.
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- Low air consumption.
- Large die area.
- Roller bearing flywheel.
- Bronze main and crank bearings.

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SERVICE MACHINE CO.
Mfrs. of Rousselle Presses
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CIRCLE INFORM-A-GRAM KEY NO. 861

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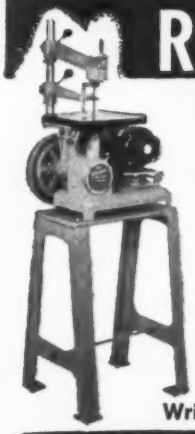

DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS
. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

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228 PARK AVENUE BELGIUM, WISCONSIN

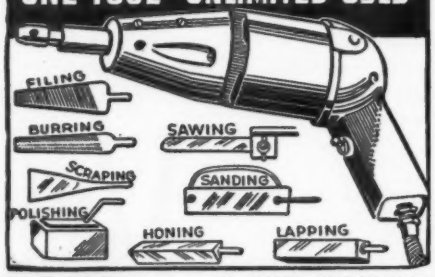
CIRCLE INFORM-A-GRAM KEY NO. 862

B-R-E-A-K . . . Hand Finishing Bottlenecks
with our
PORTABLE ELECTRIC
RECIPROCATING TOOL

This handy tool will cut out many tedious hand filing and finishing operations — Increase Production — Produce Uniform Work.

Light in weight — Delivers 1/8" or 3/16" fixed stroke at 1000 strokes per minute — Operates on 110 volts AC or DC.

ONE TOOL - UNLIMITED USES



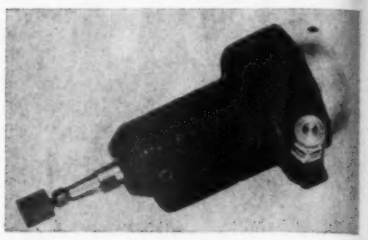

ACME TOOL CORP.
75 WEST BROADWAY
NEW YORK 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 863


## Grinding & Finishing

PROCESSES & PRODUCTS & PROCESSES

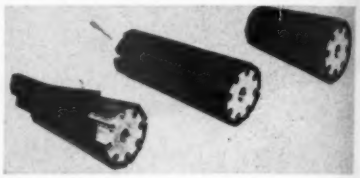
**Convenient Push Button Stop Brake** and new speed regulator for rotary files and burrs are features of the new air jet hand grinder.



This model has 75,000 rpm speed. Write to M-F Engineering Co., 13828 S. Western Ave., Blue Island, Ill., for bulletin, or Circle Inform-A-Gram No. H1.

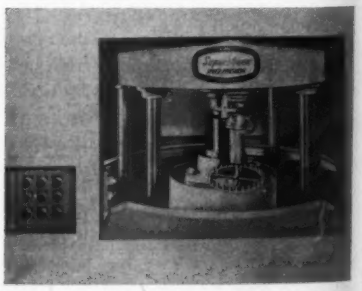
**A Carbide Hand File** bulletin gives dimensions on various models for production filing and deburring. Specials are illustrated, as are the junior mills and lab mills. Write to Severence Tool Industries Inc., Dept. 650, Saginaw, Mich., or Circle Inform-A-Gram No. H2.

**Reduce Abrasive Costs One-Third** using Flexcone, a new expanding-type abrasive cone that eliminates much abrasive waste. Abrasive sleeves are retained on wheel un-



der all grinding conditions and speeds ranging from 2000 sfpm up. Nu-Matic Grinders, Inc., 8224 Carnegie Ave., Cleveland 3, or Circle Inform-A-Gram No. H3.

**Continuous In-Line Production** of precision finished parts is a feature of five new spindle-type finishing machines announced by Almco, Queen Products Div'n, King-Seeley Corp., Albert Lea, Minn. Complete



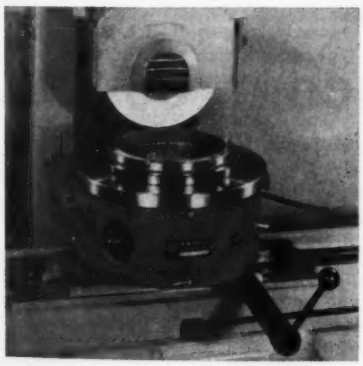
high quality components such as gears, bearing cages, and spline shafts can be handled. Get bulletin from the company, or Circle Inform-A-Gram No. H4.

**New Flat Lapping Machines** eliminate manual work of hand lapping while providing extreme accuracy of flat work surfaces. Accuracy held within 0.0000116". Spiralap relaps its own plates to keep quality high and eliminates conditioning rings. Micromatic Hone Corp., 81-0 Schoolcraft, Detroit 38, or Circle Inform-A-Gram No. H5.

**Select Industrial Diamond Tools** for general and special applications. Quality, size, and diamond shape, and formulation of special alloys and setting materials are described. Catalog is available from A. Landau Co., 247 S. 9th St., Philadelphia 7, or Circle Inform-A-Gram No. H6.

**Three New Power Quills** have speed ranges from 20,000 to 45,000 rpm and permit holding tolerances to within 0.0001" on all types of metals, including alloy steel. Super 55 and 55D models provide new precision production milling of small parts and Super 65 is for heavier material feeds. Precise Products Corp., Racine, Wis., or Circle Inform-A-Gram No. H7.

**A New Roto-Grind** features speed control from 20 to 60 rpm, clutch for hand-operating and adaptability. It fits many types of surface grinders. Rough or precision work and



internal or external grinding are possible with Model 710-V. Get details from M & M Tool & Mfg. Co., 1124 E. 3rd St., Dayton 2, Ohio, or Circle Inform-A-Gram No. H8.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PRECISION
VERNIER
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Dull chrome plated, will not chip or peel.
Exceptionally easy to read. Clear, wide Vernier slide.
Hardened Stainless Steel. Read inside, outside and depth measurements from the same scale. English or English and Metric combination in handsome contour case.

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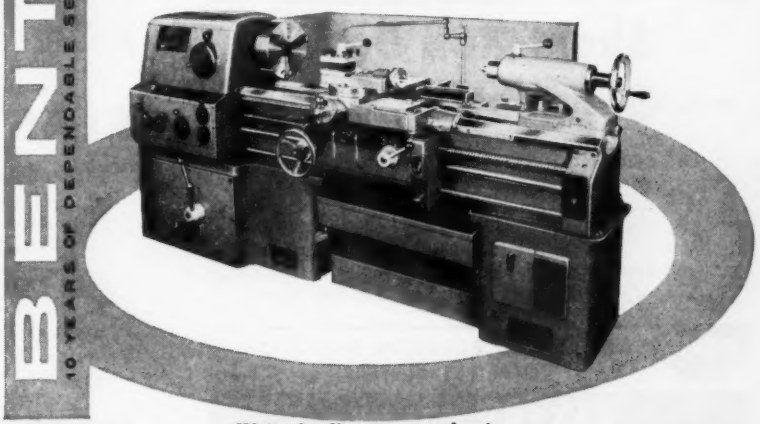
**Now with 3 1/16" spindle bore and hardened ways for lasting accuracy and powerful cut.**

- 18" swing (removable gap piece) • Up to 80" center distance
- 7½ hp • 18 spindle speeds • 20-1000 rpm • 80 feeds
- Hardened and ground gears • Oil bath, twin-clutch apron
- Totally enclosed feed-box and a host of other exceptional quality-design and safety features.

15", 17" and 22" models available.—Thousands in use, backed by our prompt and complete service.



Write for literature and prices.

BENTLEY INDUSTRIAL CORP.

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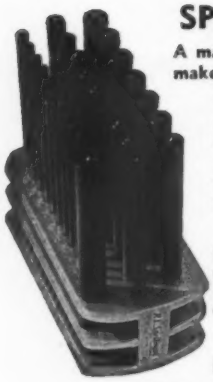
CIRCLE INFORM-A-GRAM KEY NO. 872



## SPELLMACO SPOTTERS

**A matched set of transfer punches for toolmakers, machinists and tool cribs.**

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

**Set No. 3-17: 28 punches with indexed stand—sizes 3/32" to ½" by 1/64" plus hand 17/32" size—length 4⅞". PRICE only $17.90**

**Single size available.**

**R. L. SPELLMAN CO. • Urbana, Ohio**

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**Immediate delivery on OK**
**Bronze Wear Plates**
**Composite**
**Die Sections**

SHEAR BLADES
CUT-OFF BLADES
WORK-REST BLADES

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***Get a* CRARY CALCULATOR**

Designed to provide a quick and easy method of selecting mechanical and hydraulic presses for blanking, drawing and forming jobs. Gives correct speed for particular stroke and metal being worked. Adopted as standard by the press industry. Thousands in use. 9½" square, made of durable Vinylite. Complete with 70 page handbook of press data and leatherette case. Write for illustrated folder.
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**Make 3 hammers AT ONCE!**

It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

COMPLETE LEAD HAMMER SERVICE

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IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

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**HEIMANN TRANSFER SCREW SETS**

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money too!

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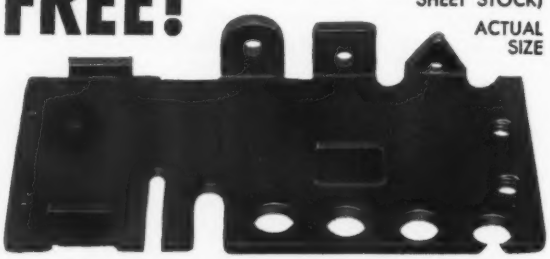

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**ENGINEERS** responsible for the design function will welcome this practical short-run stamping sample which *visibly* shows various common conditions that occur in metal fabrication.

An actual production sample, it indicates typical mechanical problems met with in terms of type of material, temper and thickness.

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**DAYTON ROGERS** *Manufacturing Company*

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## ELASTICONE® COVERS

Plan ahead . . . specify Elasticones by size and number on your next drawing—get automatic protection for shafts, bushings, lead screws, guide pins or hydraulic rams—wherever precision and lubrication must be preserved.

Elasticones are spirally wound flat alloy steel cones available* in standard sizes for immediate delivery. Write for complete information and new data sheet '58.

**CENTRAL** Safety Equipment Co

6603 Marsden Street Philadelphia 35, Pa.

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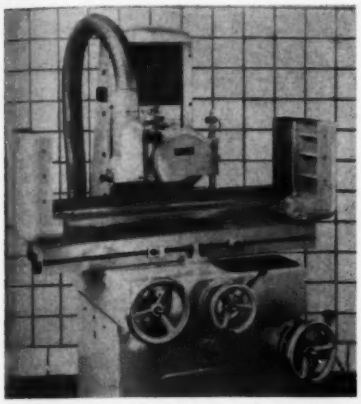
## Grinding & Finishing

**Tungsten Carbide Blades** for Wheelabrator airless abrasive blast cleaning equipment are presented in a bulletin. Explains how blades were designed for use in abrasive blast wheels to give long life and to reduce blade cost in tough cleaning applications. Request bulletin from Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind., or No. H9.

**A New Hand-Operated Hydraulic Surface Grinder features** high precision ball bearing assemblies running in hardened ground and lapped replaceable steel ways and a



fine screw-on head elevating wheel, with 0.00004″ readings. Model 816 has 8″ x 16″ table surface and 16″ under spindle. Hermes Machine Tool Co., Inc., 48-15 Northern Blvd., Long Island City 1, N.Y., or Circle Inform-A-Gram No. H10.

**A Chempound Selector Chart** is a helpful guide to application of barrel finishing compounds. The chart gives metals, finish, processes, media, and characteristics for each Chempound type. Get your copy from Techline Div'n, Wheelabrator Corp., 1183 Avenue V., Vicksburg, Mich., or Circle No. H11.

**"The Inside Story"** outlines and illustrates modern techniques and processes used in manufacturing and testing abrasive wheels and segments for Blanchard surface grinders. Copies can be obtained from The Blanchard Machine Co., 64 State St., Cambridge 39, Mass., or Circle Inform-A-Gram No. H12.

**A New Low-Cost Gear Checker,** designed for roll checking a wide range of gear sizes, is covered in a bulletin. Using master gears rotating on a spindle in a replaceable precision bushing, the checker indicates rolling errors on a dial gage in 0.0005″ increments. Ask for Bulletin 607 from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, or Inform-A-Gram No. H13.

**A Persuasive Abrasives** catalog covers SAE specifications on abrasive shot, grit, and cut wire. Includes methods and advantages of shot peening and impact cleaning, and proper abrasive mixtures. Quality control procedures are outlined to show steps taken to insure top quality abrasives. Get copy from The Cleveland Metal Abrasive Co., 888 E. 67th St., Cleveland 3, or Circle Inform-A-Gram No. H14.

**Abrasive Precision Surface Grinders** are detailed in a catalog that gives models, dimensions, and descriptions, and describes and illustrates features. Hand feed, face, and surface grinders are covered. Write to Landis Tool Co., Waynesboro, Pa., for a copy of Catalog CGS-59, or Circle Inform-A-Gram No. H15.

**A New Saddle Control** for Taft-Peirce No. 1 precision grinder is the subject of a bulletin that discusses time saving and accuracy features. Roller ways, special anti-backlash cross feed screw and nut assembly, and protective dustguards have been incorporated between table and saddle for improved performance. Get Bulletin MT-003 from Taft-Peirce Mfg. Co., Woonsocket, R.I., or Circle Inform-A-Gram No. H16.

*Illustrated—Logansquare Cylinder Meets J.I.C. Standards*

Look to Logan

**the ultimate in air cylinder design**

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- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD. VALVES
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COMPANY _____

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CIRCLE INFORM-A-GRAM KEY NO. 89

# Tools Can Be Taught

*to think for themselves...*

The *MICROtrol* • system of machine tool control can automate your entire production cycle . . . or *any part* of it. You can adapt the *MICROtrol* 160 System to inspect each piece, sort out rejects, and tell the operator *when* and *how much* correction is required. Or, you can automate only the inspection or the sorting operation . . . according to your needs.

You can choose from 54 control components that can be combined to attain any stage of automation in . . .

- *Grinding*
- *Cutting*
- *Turning*
- *Shaping*
- *Milling*
- *Boring*

The components are easy to install, and simple to use. The system is completely flexible, and can be adapted to your operation all at once . . . or in stages.

***LET US SHOW YOU HOW***

The *MICROtrol* System will improve your plant's production capability. One of our field engineers will survey your operation, tell you which *MICROtrol* elements you need.

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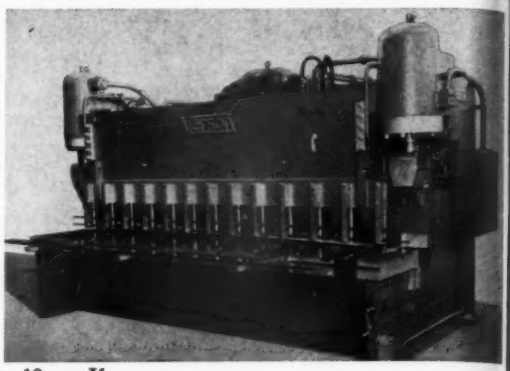
A DIVISION OF CUTLER-HAMMER, INC.

CIRCLE INFORM-A-GRAM KEY NO. 901

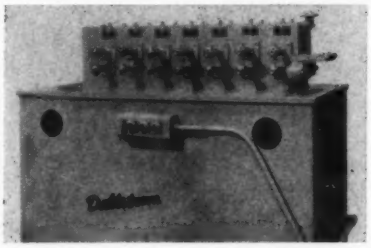

## Pressworking

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS

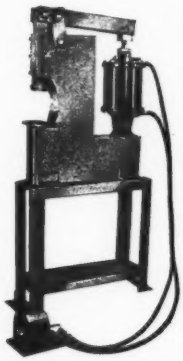


**A New Line of Hydraulic Shears** has capacities from 8′ lengths of ⅜″ mild steel to 12′ lengths of 1½″ mild steel. Designed with a minimum shear angle of 1⅛ in/ft, eliminating curling of sheared piece. Equipped with automatic control to keep operating at predetermined shear angle. Handwheel adjusts angle. Verson Allsteel Press Co., 9300 S. Kenwood Ave., Chicago 19, or J1.

**A Small Versatile Roll Forming Machine** is designed for such things as moldings and weatherstripping. Features welded steel construction, spur gear design, roll diameter range

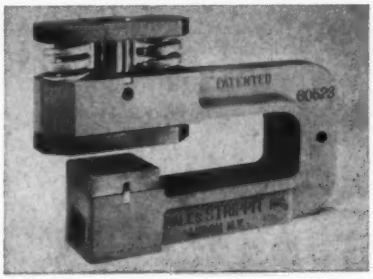


of 2½″ to 3¼″. Get details from Dahlstrom Machine Works, Inc., 4227 W. Belmont Ave., Chicago 41, or Circle Inform-A-Gram No. J2.



**Punches, Angle Shears,** angle and sheet metal notchers, and deep throat punches are completely listed in a catalog. Specifications for these items are given. Write for Catalog 49 to J. F. Kidder Mfg. Co., Inc., 420 Colchester Ave., Burlington, Vt., or Circle No. J4.

**Dual-Range Capacity** is a feature of the new Strippit punching unit. Can be altered from 0.250″ to 0.750″ capacity in mild steel by changing

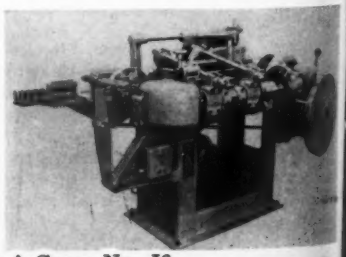



stripping springs. Wales-Strippit, Inc., 212 S. Buell Rd., Akron, N.Y., or Circle Inform-A-Gram No. J3.

**A New 25-Ton High Production Press** has proven production line capacity of 1,000 strokes/min. Model 1625 features a counter-balancing

system which works in opposition to force frequencies set up by slide to minimize vibration. Get details from E. W. Bliss Co., Press Div'n, 1375 Raff Rd., S.W., Canton 10, Ohio, or Circle Inform-A-Gram No. J5.

**This Space-Saving 4-Slide Forming Machine** is mounted on a welded steel pedestal base for maximum strength and rigidity. The S-1-F machine, designed primarily to stamp and form ribbon metal in one operation, also forms wire with a maximum feed length of 8″. Handles up to 3/32″ dia wire and 1¼″ wide ribbon metal. The A. H. Nilson Machine Co., 600 Bridgeport Ave, Shelton, Conn., or Circle Inform-A-Gram No. J6.



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with 4" – 6" or 10 INCH STROKE CAPACITY

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- Automatically filled hydraulic system
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- Sealed—oversize ball bearings on spindle and shaft
- Sealed unit construction *permits mounting in any position*
- Mounting surfaces on three sides for installation flexibility

Find out now—why Holomatic drill units are setting the pace in progressive production plants across the nation. Your Hause representative will gladly demonstrate their multiple dollar-saving efficiencies right in your plant.

***Write today*** *... for demonstration or additional information, specifications and prices on the new Holomatic "Air-Hydraulic" Drill units, "Balanced Air" Threading units, "Lead Screw" Tapping units, complete machines or full line of machine bases and accessories.*

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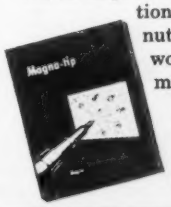


**WRITE** for manual on the complete line of Magna-tip bit holders, finders, sockets and hand screwdrivers. Dept. 88G3, Magna Driver Corp., 779 Washington St., Buffalo 3, N. Y.

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Representatives in all principal cities.

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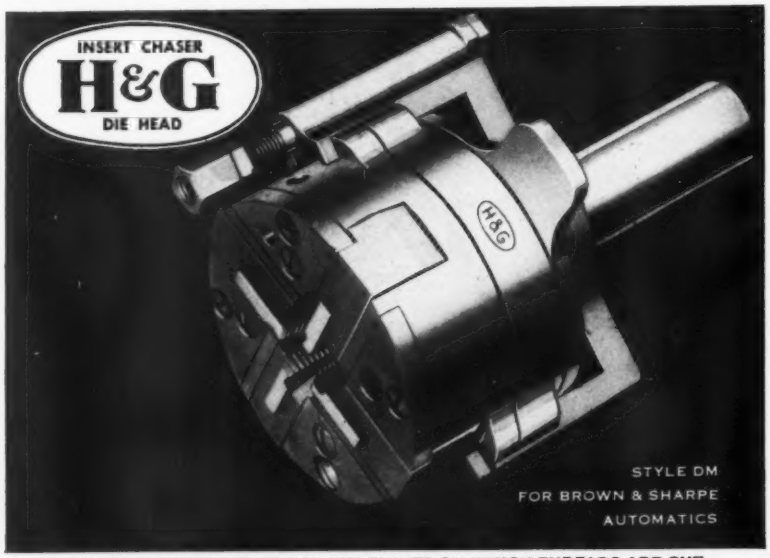


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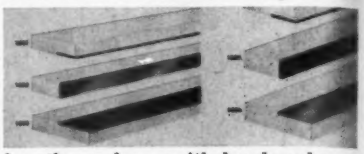


lengths or bars, with hardened, machined, and ground cutting or forming edge. Write to The Ohio Knife Co., Dept. LL-89, Cincinnati 23, for Bulletin CDS-100, or Circle J7.

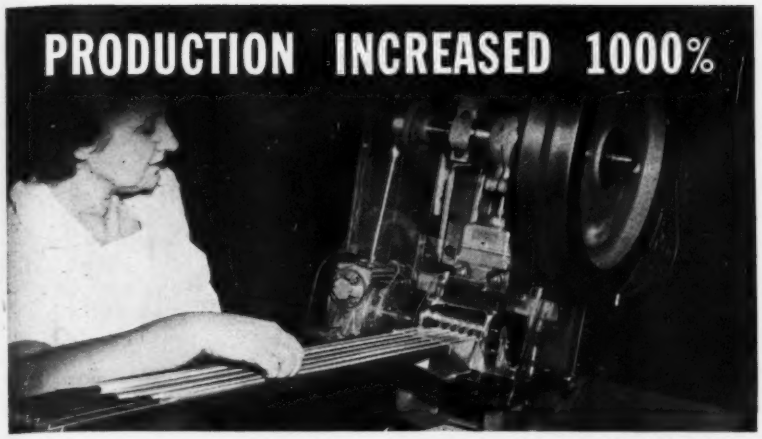
**Special Adaptations** and variations available in the field of unit tooling are described and illustrated in a bulletin from Tool Products Corp., 377 Old Falls Blvd., N. Tonawanda, N.Y. Applications with standard equipment and some shapes of punches and dies used in this unit tooling are shown. Get a bulletin from the company, or Circle J8.

**When This 8-Ton Electro-Safe Punch Press** is used in single trip operations, the operator must depress two widely separated hand controls and hold until the ram reaches the bottom of the stroke. A

brake automatically stops work if power fails and a stop button is in easy reach for emergencies. Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, or Circle No. J9.

**A New 4-Ton Punch Press** designed for automatic electrical terminal crimping, and adaptable to other press operations, is discussed in a bulletin. Specifications and design features are given. Get your copy from Alva Allen Industries, 1001-15 N. 3rd St., Clinton, Mo., or Circle No. J10.

**Design and Production of Heavy Press Aluminum Extrusions** are detailed in a 16-page brochure. Equipment, practices, and procedures for quality control and die design and die making also are described. Write to Harvey Aluminum, 19200 S. Western Ave., Torrance, Calif., for a copy of "Heavy Press Extrusions," or J11.

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Six rubber strips are roll fed automatically into the dies and the punched parts are dropped out of the die, six at each stroke, and carried away on a power driven belt conveyor. Production is reckoned on the basis of a six hour run per shift.

The cost of producing this item has been substantially reduced because Kenco Engineering enables this press to sustain production at 500 strokes per minute using adjustable automatic feed. The press is equipped with roller bearings which support the crankshaft, connecting rod and flywheel. Automatic lubrication is used with the result that this Kenco press will operate around the clock at high speeds showing no appreciable wear of the moving parts while permitting maximum life of the dies.

Let Kenco Engineers help solve your problems where more profitable punch press operation is your goal. Kenco presses are made in 2, 5, 8, 12, 15, 18, 21 and 26 tons capacities, with 108 Models to select from—the largest selection of small presses available anywhere.

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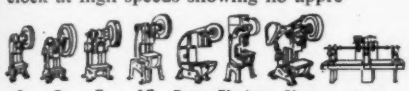
**Feed:** Automatic adjustable roll feed.
**Stock:** Rubber strip.
**Production Advantage:** Increased 10 times at rate of 500 spm compared to production on replaced equipment.
**Maintenance:** None to date.

**WRITE TODAY** for free literature describing the modern mechanical features and complete specifications of Kenco Presses.



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# Toolroom

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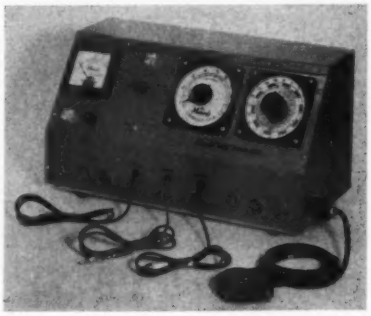
**A Controlled Etch Power Unit** etches to a 0.003″ depth or more, depending on alloy being marked, with no raised surface, no hydrogen embrittlement, and no molecular



distortion. Etch mark can be read after part is anodized or painted. Get Model 505 Bulletin from Monode Inc., 3751 Prospect Ave., Cleveland 15, or Circle Inform-A-Gram No. K1.

**A 48-Page Punch and Die Catalog** is a comprehensive source of information on the complete range of types manufactured by Geo. F. Marchant Co., 1420-34 S. Rockwell St., Chicago 8. Includes dimensional drawings of all styles of punches and dies. Get Catalog 60 from the company, or Circle Inform-A-Gram No. K2.

**A New Tool Template Set,** three tracing templates of tool clamps and associated components, helps in designing test fixtures, milling fixtures, and jig components. Get a set from PIC Design Corp., 477 Atlantic Ave., E. Rockaway, L.I., N.Y., or Circle Inform-A-Gram No. K3.

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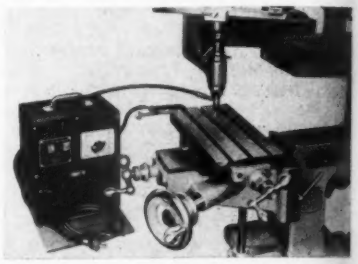
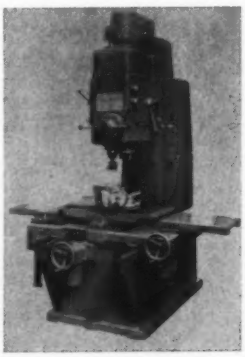
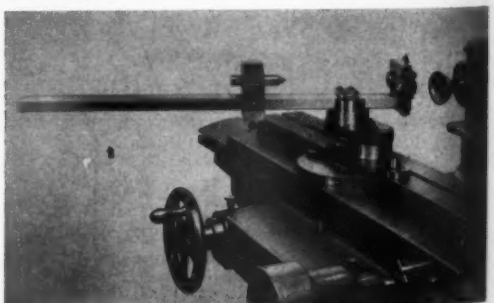


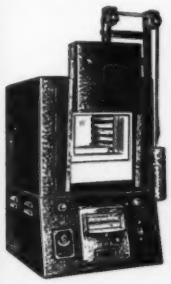
transformer and electrical marking spindle in place of rotary cutter spindle. H. P. Preis Engraving Machine Co., 284 Industrial Branch, U. S. Highway 22, Hillside, N. J. or Circle Inform-A-Gram No. K5.



**An Improved Optical Jig Boring Machine** features large projection screens easily read in upright position in the same field of view, instead of microscopic reading. Also has push-button controlled table with power feed in both directions. ABA Model VLP-600 maintains ±0.0001″, has 27½″ x 15¾″ working area, and 7″ quill travel. Get details from Columbia International Corp., 10-35 44th Dr., Long Island City 1, N. Y., or Circle No. K6.



**This New Multi-Purpose Fixture** offers a simple, accurate means of sharpening single and multiple-flute gun drills, gun-type reamers, and conventional reamers mounted on a cutter grinder. Position by swinging fixture to a vernier-angle setting and position a flute stop by means of a vernier-located setup gage. Different size setup gages and bushing clamps are provided. Star Cutter Co., P.O. Box 376, Farmington, Mich., or K7.



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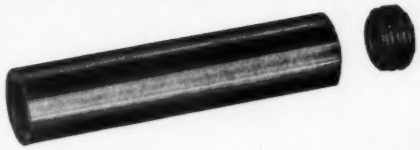
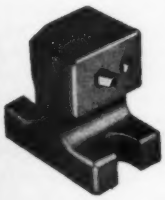
CIRCLE INFORM-A-GRAM KEY NO. 951

## How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!



One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.



The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
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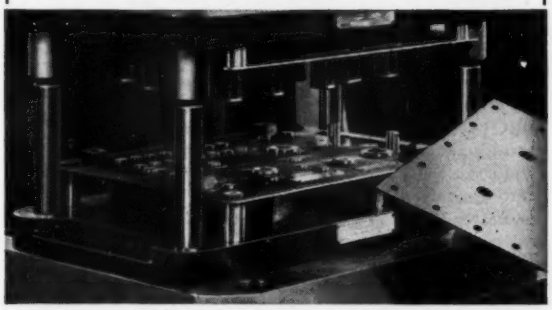

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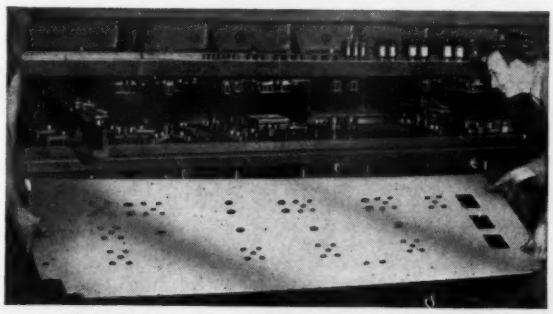

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Precision ground threads for accurate adjustment

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*Quality* MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 961

## Grind Tools Like These From Solid— with WARDWELL Automatic Universal FLUTE GRINDER

Grinds straight or spiral flutes from solid, including carbides, in tools such as:

Drills as small as 1/16 inch dia. . . .
Spiral or straight taper reamers . . .
Spiral or straight milling cutters and end mills . . .
Sharpens saws up to 12 inch in diameter and in gangs up to 7-3/4" long.

WARDWELL
3809 Ridge Road
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AUTOMATIC INDEX FEED
WRITE FOR BULLETIN 90-FS

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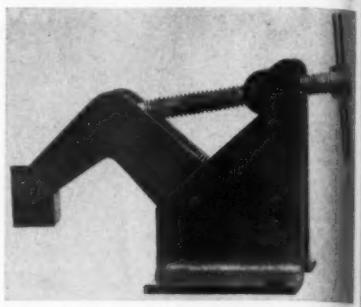
## Toolroom

**This New Small Fixture Clamp** has been added to the line of Saxton Mfg. Co., 1517 N. Potrero Ave, S. El Monte, Calif. The 2" clamp



has all the features of the larger models. Get more information from the company, or Circle Inform-A-Gram No. K8.

**Rolled Tooling Plate,** used to make industrial tools, jigs and fixtures, is outlined in a bulletin. Design data, applications, mechanical properties, and types available are covered. Write to Kaiser Aluminum & Chemical Sales, Inc., Dept. NR-30, 919 N. Michigan Ave., Chicago 11, for a copy, or Circle No. K9.

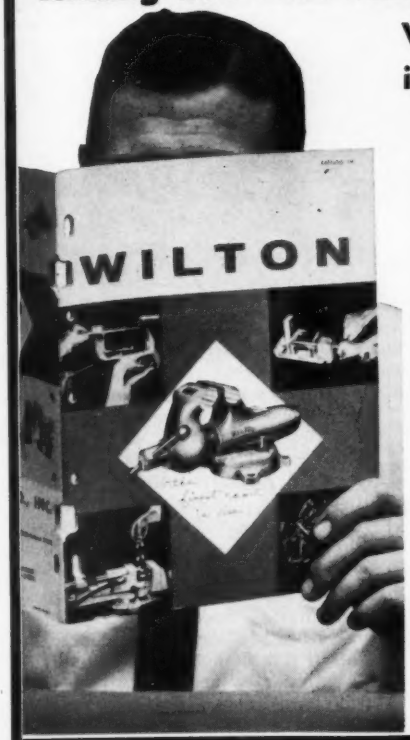
**Use This Low Cost Tool Bit Grinding Fixture** on surface grinders to quickly set up for any combination of rake and clearance angles. Grinds all sides in one setting

and holds any single-point tool. Tool bit capacity is ½" x 2¼". Montgomery & Co., 401 Morris Ave., Springfield, N.J., or Circle Inform-A-Gram No. K10.

**"Resharpening of Milling Cutters"** tells how electrolytic grinding cuts costs by speeding operation and eliminating breakage. Includes information on how method works and equipment used. Write Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, for Bulletin 130, or Circle No. K11.

**A Jergens Live Roller Bearing Bushing** catalog describes advantages and applications of the items in jigs and fixtures, special machines and automation equipment, and the use of live bushings in horizontal milling machine outboard support applications. Get catalog from Donley Products, Inc., 11106 Avon Ave., Cleveland 5, or Circle Inform-A-Gram No. K12.

# Exciting new best seller! Yours FREE!




## Wilton's new "book" is more than a catalog

It's actually a production know-how manual that shows you in-plant photos and operating case histories of how Wilton clamping tools (both manual and powered) have been used by the best brains in the business to save production time and money. Of course we show our line, and that too is unique — **Wilton has the most complete line of clamping tools in the world.** Write for your copy now; it's an education that will pay dividends in your plant. No obligation, of course.

**WILTON**

**Wilton Tool Manufacturing Co., Inc.**

**SCHILLER PARK, ILLINOIS**

TP69

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# FAST, CLEAN, ECONOMICAL HEAT

Provides high, fast heat for metal bending, metal forging, occasional heat treating, metal forming and preheating. Clean, efficient, equipped with four burners. Two end burners have separate shut-off valves, may be turned off for smaller jobs. Operates economically on any type of gas. Convenient gas-air adjustment panel. Adjustable swinging refractory lid. Adjustable front rack to support long pieces and hold tools. Solenoid safety valve turns gas off automatically when blowers are turned off. High temperature, insulated firebox, 5½" by 7½" by 27". Maximum 425,000 BTU input. F.O.B. Factory $246.00.

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if it burns gas look to Johnson — Since 1901

*johnson*

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**Johnson Gas Appliance Company**
575 E Avenue N.W.
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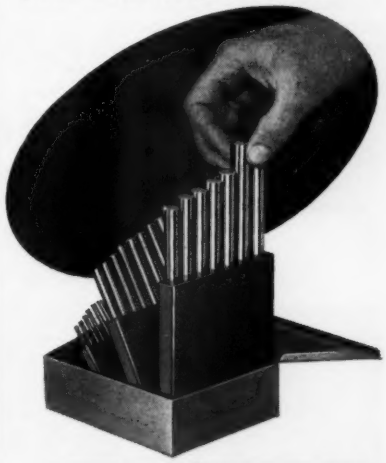
*Now available in 182 standard sizes to meet your exact requirements*



# ACE

**hardened high speed steel**

## DRILL BLANKS

These versatile, low-cost drill blanks are made of top quality, uniformly hardened high speed steel precision ground to exacting tolerances to meet the requirements of countless applications. Ideal for use as dowels, punches, knockout pins, gages, and rollers. Readily adaptable to form a wide variety of end cutting tools, too. And they're offered now in 182 standard stock sizes and in sets as shown.

Call your local Ace Drill Distributor today!

**NEW CATALOG** covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

**ACE DRILL**

ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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# Pneumatic & Hydraulics

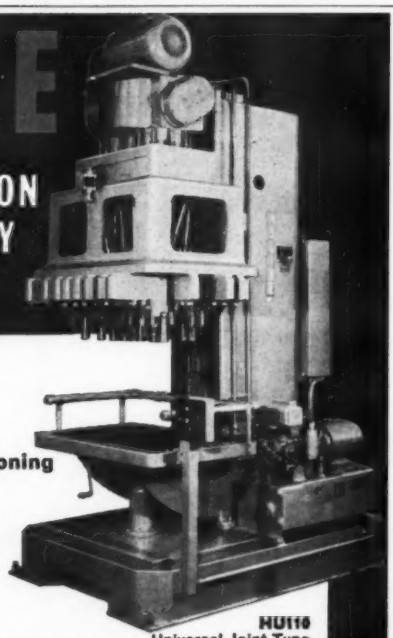
PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES

**A New Combination Air Power Cylinder** and electrically-actuated control valve with built-in speed controls is a single power package. Installation requires only one air line connection and simplified wiring to the solenoid-actuated piloted-operated valve. Get details of Air Motor from Hannifin Co., Dept 164, Des Plaines, Ill., or Circle Inform-A-Gram No. L1.

**An Air and Hydraulic Cylinders** bulletin deals with low and high pressure, Pemaco, automation and standard air cylinders, and hydraulic and Powermaster types. Explanations, dimensions, applications, and selection data are included. Request Bulletin 8a, from Petch Mfg. Co., 463 York St., Detroit, or Circle Inform-A-Gram No. L2.


MOLINE

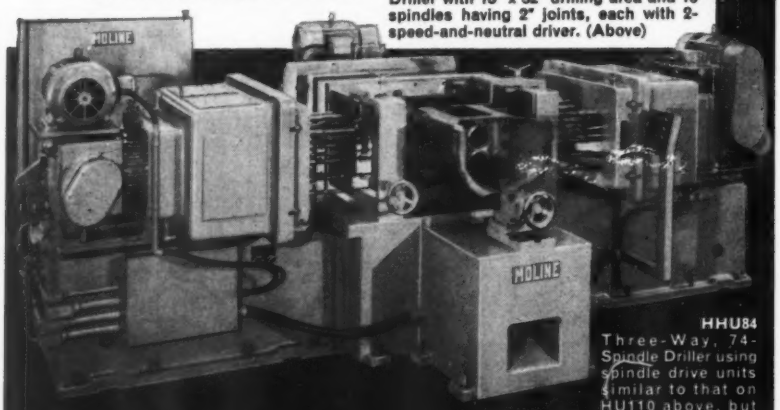
FOR GREATER PRODUCTION EFFICIENCY SAVINGS



*Use rugged, reliable "Hole Hog" machine tools for such jobs as:*

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

**HU110**
Universal Joint Type Driller with 18" x 32" drilling area and 16 spindles having 2" joints, each with 2-speed-and-neutral driver. (Above)



**HHU84**
Three-Way, 74-Spindle Driller using spindle drive units similar to that on HU110 above, but with slip-type spindles.

★ Over 58 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL COMPANY
100 20TH STREET, MOLINE, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

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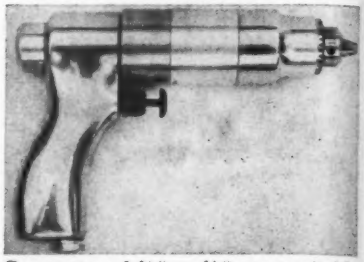
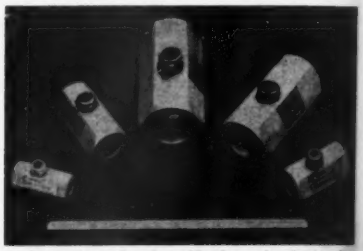
**A New All-Purpose Governor-Controlled Pneumatic Drill** permits speeds to be set from 750 to 3500 rpm, allowing for drilling of any material from stainless to aluminum.



Capacities of ¼" or ½" are available from D-K Products, Inc., 1056 S. Gerhart Ave., Los Angeles 22, or Circle No. L3.

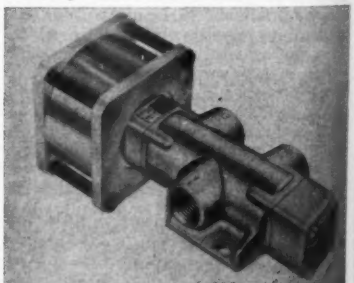
**High Pressure Solenoid Valves** with 3000 psi operating pressures are described in a bulletin from Fluid Power Accessories, Inc., Glenview, Ill. Features, engineering data, installation dimensions, and list of models are given. Get a copy from the company, or Circle Inform-A-Gram No. L4.

**Vairi-Speed Control Valve** is a combination needle and ball-check valve used to control speed of a single- or double-acting air or hydraulic cylinder by restricting flow from



exhaust end of cylinder during piston movement in one direction. Control Line Equipment, 19560 Center Ridge Rd., Cleveland 16, or Circle Inform-A-Gram No. L5.

**This New Versa Diaphragm Valve** meets the demand for a low pilot pressure actuator and is an ideal directional control valve for use where pilot (or signal) pressures are necessarily low. Available in either



sideport bodies or for manifold mounting, in sizes from ⅛" to 1" NPT. Get Bulletin 259 from Versa Products Co., Inc., 249 Scholes St., Brooklyn 6, N.Y., or Circle Inform-A-Gram No. L6.

# SPECIALIST

*dead true at the center!*

## —in draw-in COLLETS

Made in standard and special styles for all lathes, grinders, millers, and fixtures. Fractional round sizes and decimal equivalents from 1/64" to capacity; square, hexagon and taper holes. Checked 25 times against master gauges. Transparent packaging for easy identification.

*Stocked in standard styles for immediate delivery.*

Get free Bulletin 100 E showing standard draw-in collets and step chucks

RIVETT

**RIVETT LATHE & GRINDER, INC., Department CTP-6, Brighton 35, Boston, Mass.**

CIRCLE INFORM-A-GRAM KEY NO. 991

## Do your machine operators have this *EXACT KNOWLEDGE?*

**With COMTORPLUG they read hole size to a fraction of a "tenth"**

Thereby they can exert timely control over their machines to —

- eliminate rejects.
- improve quality.
- increase production.

The *cost is reasonable,* making it practical to equip everyone who needs the EXACT KNOWLEDGE of automatic 2-point gaging of precision bores: showing diameter, tapers, ovality, barrel shape, etc.

for holes 1/8" to 10" diameter

**USERS LIKE THESE DEPEND ON COMTORPLUG**

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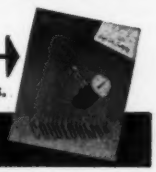
Comtor Co., 82 Farwell St., Waltham 54, Mass.



**COMTORPLUG**

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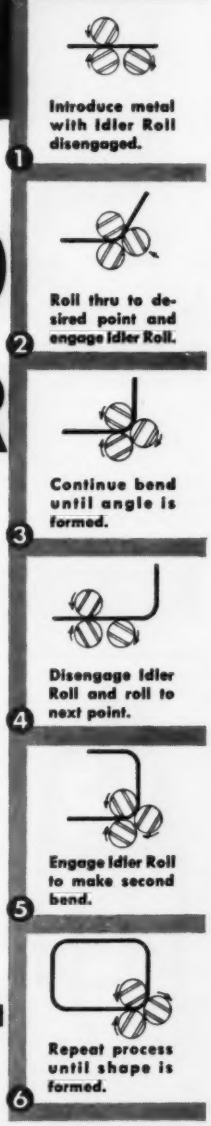
# HOW TO FORM a rectangular shape

**with the**

# DI-ACRO ROLLER

Forming small and large circles without flat spots and a variety of other sheet metal shapes is easily accomplished on the Di-Acro Roller with its *exclusive cam actuated Idler Roll.* Consult the yellow pages of your phone book for the name of your nearest Di-Acro distributor or write for six page instruction folder.


1
Introduce metal with Idler Roll disengaged.
2
Roll thru to desired point and engage Idler Roll.
3
Continue bend until angle is formed.
4
Disengage Idler Roll and roll to next point.
5
Engage Idler Roll to make second bend.
6
Repeat process until shape is formed.

**pronounced die-ack-ro**

di-acro PRECISION METALWORKING MACHINES

**O'NEIL-IRWIN MFG. CO.**

315 Eighth Ave., Lake City, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 993

for as little as $22.00 COMPLETE IN U.S.A

Get This Production Boosting

"TRICO - MIST" COOLANT SYSTEM

*With Flexible Armored Coolant Lines And Kwik-Change Nozzle With Guard.*

For drilling, tapping, milling, sawing, grinding, etc. Removes heat from cutting edges of tools and work. Feeds can be increased considerably, finer finishes and accuracy are obtained. TRICO-MIST absorbs heat, thereby quenching it faster than flood coolants which only transfer it. Chips slide freely up the tool face and are blown away automatically. Simple needle valve controls size and volume of mist spray. Attaches to shop air line. Available with one and five gallon containers — single or multiple outlets — single or dual valve control.

SEND FOR BUL. No. 37

TRICO FUSE MFG. CO.
MILWAUKEE, WIS. U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1001

COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the die-maker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

*Sole Distributors*

MOORE SPECIAL TOOL CO., INC.
726 Union Avenue Bridgeport 7, Conn.

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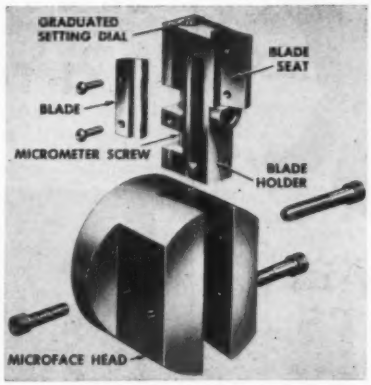
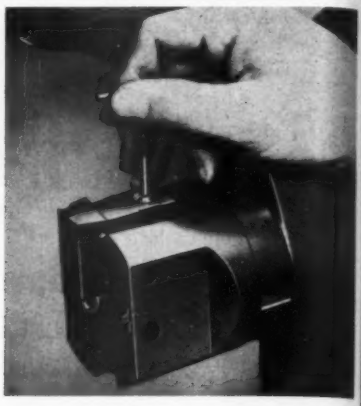
# Machining

PROCESSES & PRODUCTS & PROCESSES & PRODUCTS & PROCESSES & PRODUCTS



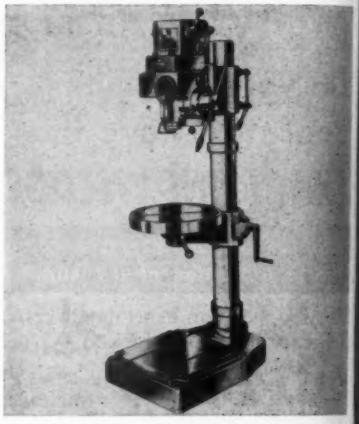
**A New Adjustable Blade Facing Head** for precision plunge facing of wide surfaces has been announced by DeVlieg Micro Div'n, DeVlieg Machine Co., Fair St., Royal Oak, Mich. Microface heads eliminate special tooling to bore, face, or spot face wide surfaces. Features solid one-piece head to assure maximum rigidity and extend tool life. Interchangeable high speed steel or carbide blades are replaceable on the machine to provide minimum downtime. Get bulletin from the company, or Circle No. M1.

**A New Auto-Tracer Lathe** is explained in a brochure which describes the machine's automatic tracing cycles, variable components, design features, and specifications. Controls for quick setup and operation are detailed. Get Model 30 lathe bulletin from Jones & Lamson Machine Co., Springfield, Vt., or Circle Inform-A-Gram No. M2.

**High Speed Drill Blanks** are offered in fraction sizes from 1/64" to 1/2", in wire gage sizes from No. 80 to No. 1, and in letter sizes from A to Z. Used for making boring and burring tools, countersinks, and punches. A bulletin is available from The Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, or Circle Inform-A-Gram No. M3.

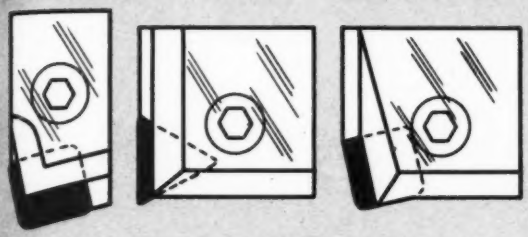
**Increased Productivity** in handling multiple-hole drilling operations on cumbersome parts is possible with a new attachment for adapting large multiple-spindle drilling and tapping heads to radial drilling machines. An air counterbalance and 360° ball bearing swivel attachment is combined for greater flexibility and easier adjustment. United States Drill Head Co., 616 Burns St., Cincinnati, or Circle Inform-A-Gram No. M4.

**A New Line of Heavy-Duty Drill Presses** provides a gear drive for tools in the medium capacity range. Line includes 1" and 1¼" capacity hand feed models in the 18" and 24"



classes, plus a power feed model in the 24" class. Get literature from Bcice-Crane Co., 963 W. Central Ave., Toledo 6, Ohio, or Circle Inform-A-Gram No. M5.

**A New Reversing Tapping Attachment** features easily hand-adjusted torque clutch, no force on tap, and friction - free axial movement, using tap itself as leadscrew. Literature is available from Homestrand, Inc., 9 Addison St., Larchmont, N. Y., or Circle Inform - A - Gram No. M6.



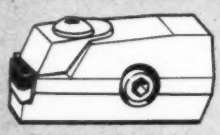
TYPICAL STANDARD WESSON COMPONENTS

# TOOL NEWS carbide

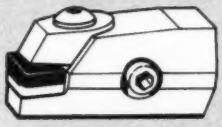
# BUILDING BLOCK TOOLING

- ***Easier to design for special applications***
- ***Maintained with smaller inventories of parts***
- ***Greater accuracy in production***

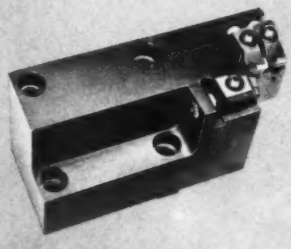
***MULTIPLE-POINT micro-adjustable and key-type boring quill combines standard insert holders of several types and a standard anvil-clamp unit. To hold these standard components in correct positions, a simple special body has been designed around their required locations.***



TYPICAL TRIANGULAR INSERT HOLDER



TYPICAL SQUARE INSERT HOLDER



***TOOL BLOCKS can be designed with the same standardized components that are used to bore and chamfer. This tool is used to rough turn and face transmission parts. Standard micro-adjustment units permit rapid setup, and each square insert has eight cutting edges.***

Any time the word 'special' is mentioned to a production engineer, he unconsciously winces. He wants the added production or the better quality that can come with specials but he does not want to have to justify the extra first cost to his boss.

All tools start out as specials but when a market is built up for a particular design, it is standardized. Now, carbide-tool producers are leading the way to greater standardization and to more widespread use of carbides.

Standard components first became normal practice with the introduction of band-type and throw-away insert type holders. The carbide slugs and inserts, and the holders had to have standard dimensions. This was so obvious that nobody recognized what it meant—either to users or producers.

It is difficult to maintain brazed-in cutting points that have to be accurately ground in relation to the tool body and to each other. However, multiple-point throw-away tooling has been used sparingly because it is the most complex of the special tools. But all production engineers recognize the tremendous advantages that are possible when several operations are combined in one tool.

Gradually, carbide throw-aways and slugs have been applied to special multiple-point tools, and the problems of grinding and setting disappeared. It is only necessary to grind off the slug and adjust it or index the insert, and the tool is ready for re-use.

Wesson recognized that most of the special multiple-point tools they were designing were made from just a few types of components. With this recognition, came an intensive investigation to determine how few different components would cover the majority of special-tool needs.

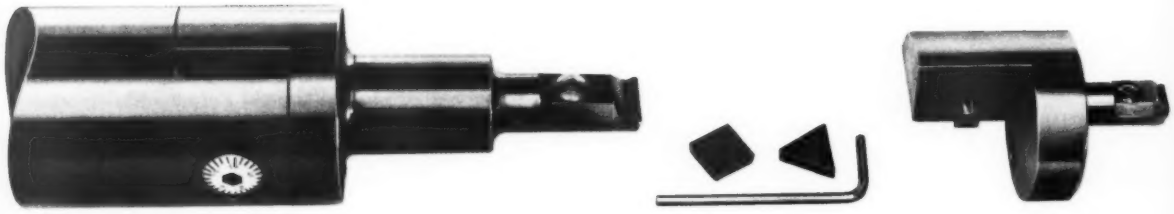
Wesson now has about 20 standardized insert holders (see inset at left) for triangular and square inserts of different sizes, and with positive and negative rakes, few of which are needed in any one tool. They have 4 standardized anvil-clamp units (see examples at top of page) for square and triangular inserts. Standardized micro-adjustable units can be applied to most bars or heads to allow for axial or radial adjustments.

***(continued on next page)***

# Wesson Announces

# NEW INTERCHANGEABLE HEAD BORING BAR

- *Head is micro-adjustable*
- *Boring bar covers range from ½" to 1½" ID*



BORING BAR AND ⅝" HEAD

½" HEAD

Carrying on the 'building-block' idea one step further, Wesson now has designed a micro-adjustable boring bar that can carry interchangeable heads for boring holes from ½ to 1½ inches in diameter. When in the bar, the head can be adjusted ¼ inch on the diameter.

This is the first time that small-hole boring has been possible with a standard throw-away insert tool that can also be used for larger holes. These tools can be maintained easily at the machine because they use standard triangular and square carbide inserts.

### Building Block Tooling

*(continued from previous page)*

Now, the design of a special multiple-point tool is a simple matter. The workpiece and its tolerances set the requirements for the types of inserts, holders, clamps, anvils and adjustments needed. Relationships among the surfaces to be machined indicate the length and breadth of the tool.

It is then only necessary to draw the standard components in space and fill in the special body required to hold the components where they belong. A check of this body is made to be sure of its strength through all sections and then the tool can be made.

Special tools will still be made by carbide-tool producers—this will not lead to do-it-yourself tooling—but the user benefits through lower costs, shorter lead times, smaller inventories of spare parts and the chance to specify special tools wherever they should be used.

tools Wesson carbide Wessonmetal

WESSON COMPANY, DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.

IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 Judge Road, Toronto 16, Ontario

# Conventional Carbide Tools Best Bet For Most Jobs

## 1. *Band type with carbide slugs*

Band-type Wesson Multicut holders are available in 9 specific types with 90 standard sizes available from stock. Holders are designed for square, triangular or diamond (with various lead angles) carbide slugs to turn, face and cut tapers. They are precision made with tempered steel bands, hardened shank and broached holes. Carbide slug can be locked from top or bottom of the holder and many tools can be packed in small areas for multiple operation. Standard Wessonmetal slugs always available from stock and replacement bands that fit can be quickly supplied.

CUTS RIGHT TO LEFT
(LEFT-HAND ALSO AVAILABLE)

## Punches and Dies

***...for foot and power presses***

Standard Punches and Dies of all sizes and shapes in stock—or made promptly to order. Also Adaptors and Die Shoes to convert your press. For power, foot or hand operation.

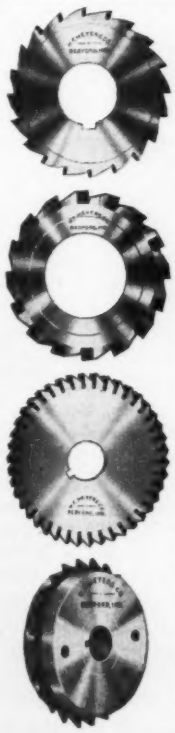
Round, square, rectangular, slotting, notching, louver, angle, multiple, knock-out and other shapes. Precision made from high grade tool steel. More than 25,000 sets in stock to choose from.

**27** *years of serving your punch and die requirements*

**SEND FOR FREE CATALOG No. 157 AF,** illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. **NET PRICES SHOWN.**

**WARD Machinery Co.** 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1031



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## Carbide Tipped and Solid Carbide CUTTING TOOLS

It costs no more to enjoy the production advantages of MEYCO tools: "precision" minded since 1888, careful workmanship, well equipped shops and capable design engineers . . . all add up to plus values for you.

The finest quality and proper grade of tungsten carbide is engineered to the cutter's job. Tools are precision ground and lapped for long life, tipped to carefully machined bodies balanced for rigidity. MEYERS works to tolerances of .0001″, tipped cutters as thin as .030″, solid carbide cutters much thinner, diameters of ¼″ and up.

Your special problems in the field of cutting, slitting, slotting, under-cutting or form-cutting are solicited.

*Write for new Cutter Catalog No. 51*

**W. F. MEYERS CO., INC., BEDFORD, IND.**

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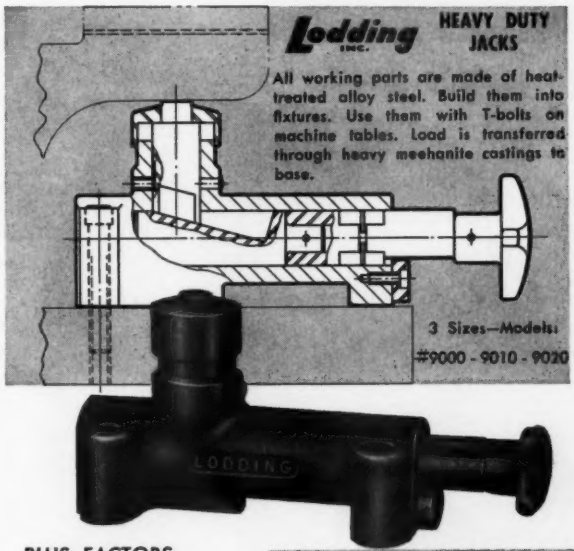
# PREFERRED

**because it**

# ...SAVES MONEY ...SAVES TIME

**The acknowledged leader in its field, LODDING appreciates the recognition and commendation it has received from the nation's outstanding tool engineers.**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HEAVY DUTY JACKS
All working parts are made of heat-treated alloy steel. Build them into fixtures. Use them with T-bolts on machine tables. Load is transferred through heavy meehanite castings to base.
3 Sizes—Models:
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*PLUS FACTORS*

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- ✓ **Forged tool steel material**

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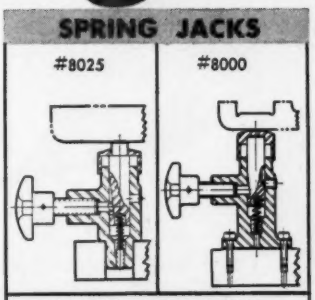
For information write




**Lodding INC.**
**AUBURN, MASSACHUSETTS**

FACTORY WAREHOUSES

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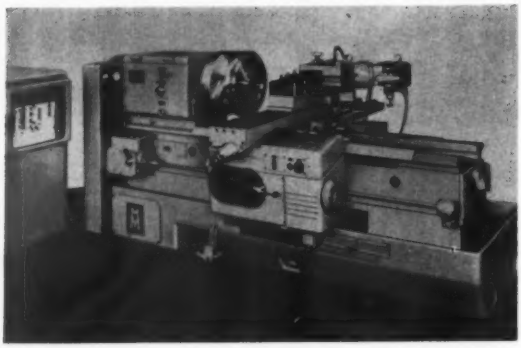
|---|---|---|
| Precision Tool Sales<br>417 E. Florence Ave.<br>Los Angeles 33, Calif.<br>PLeasant 3-1553 | Bagby Engineering Co.<br>1047 Forest Ave.<br>Evanston, Ill.<br>AMbassador 2-2273 | Southern Tool Dist. Co.<br>54 11th St. No. East<br>Atlanta 9, Ga.<br>TRinity 5-7065 |

CIRCLE INFORM-A-GRAM KEY NO. 1033

## Machining



**This High Production Lathe** provides pre-set automatic control of all tool movements on saddle, cross-slide, copy attachments, drilling units, and turret head. Electro-pilot consists of plug panel for accepting and issuing orders, prepared punch-cards, and interchangeable trip dogs. Cosa Corp., 405 Lexington Ave., New York 17, Circle No. M7.


**Buck**
Ajust-Tru® Gibbed Keyway
POWER CHUCK
with Aluminum Body

**40%**
weight saving
★
precision within
.001″
★
Adjusts under
full air pressure
★
GIBS
TAKE UP
WEAR

Those features—plus precision top jaw machining *in the tool room* (with Buck jaw-turning fixture) — give you production advantages you've never had before.

There is less down time, greater accuracy. 40% less weight means that chuckers start quicker, stop quicker, with less brake wear. 40% lighter jaws means less centrifugal force, surer grip at high speeds. And gibs to take up wear should *triple the useful precision chuck life.*

Send for complete facts. See why *"It pays to chuck with Buck."*

BUCK TOOL COMPANY
618 SCHIPPERS LANE • KALAMAZOO, MICH.
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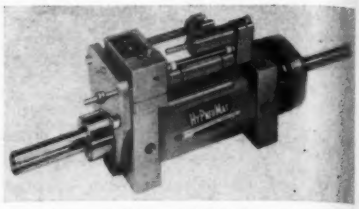
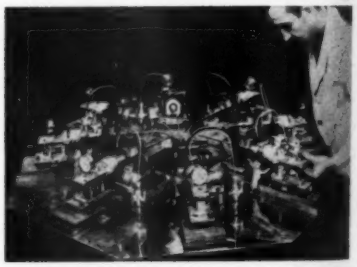
**Supply Power** for drilling and tapping operations and multi-diameter step machining with this line of long stroke automatic drilling and



tapping units. Light-duty model available in strokes to 12″ and heavy-duty type (shown) up to 25″. Hypneumat, Inc., 647 W. Virginia Ave., Milwaukee 4, Wis., or Circle Inform-A-Gram No. M8.

**Small Compact Drilling and Tapping Heads** to perform delicate operations are announced by Ettco Tool. Model 400 Knuckle-Head is fully adjustable 4-spindle type, easy to handle. Either drills or taps from two to four holes ranging from 1/32″ to 1/4″ in steel. Ettco Tool & Machine Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y., or Circle Inform-A-Gram No. M9.

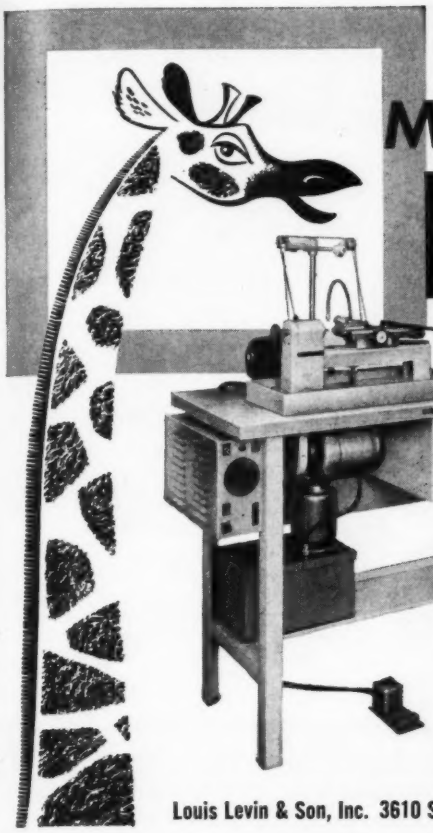
**A New High Production Ultrasonic Machine Tool** does the work of eight conventional machines for machining hard and brittle materials like silicon, ferrite, and germanium. Cavitron 8 has eight horizontal machining stations arranged in a circle on a 4½″ dia table, and handles



up to 1.08″ dia cutting tools to machine 0.050″ depth workpieces. The Sheffield Corp., Dayton 1, Ohio, or Circle Inform-A-Gram No. M10.

**New Wire Drill Chuck** for wire drills from 0.006″ to 0.020″ fits into the geared chuck of any drill press with 1/8″ capacity and tool is quick-

ly trued with touch of fingertip. Get details from The Dumore Co., 1300 17th St., Racine, Wis., or Circle Inform-A-Gram No. M11.



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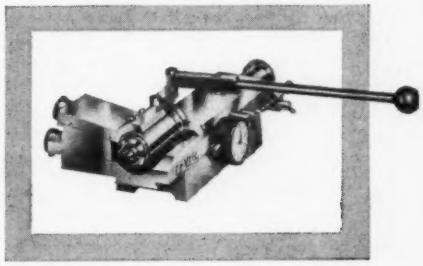
## DRILL MICRO-HOLES

DOWN TO .0016" with SPEED & ACCURACY

**LEVIN ® MICRO-DRILLING MACHINE**

Designed for the most precise drilling of small holes. The drilling spindle, as well as the head stock spindle, revolves and thus the maximum straightness and concentricity are assured. The feed is so arranged that it does not depend on the operator's sense of feel and the smallest drills may be safely used.



For full details of Drilling Machine and Instrument Lathes send for catalog T.

**Louis Levin & Son, Inc. 3610 So. Broadway Los Angeles 7, Calif.**

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NEW BALANCED CUTTING ACTION

# Severance ECARNO-MILLS

THE ECONOMY MILL NEW DESIGN NEW CARBIDE

Make your money count! Replace more H.S. Rotaries and Mounted Grinding Points.

A NEW LOW PRICED HIGH CLASS PERFORMER

*Made by the originator of ground-from-the-solid Rotary Files, and pioneer in this type of Carbide Mill, who presently offer the largest range of standard types, shapes, and sizes.*

YOUR SPECIAL DEBURRING PROBLEMS ARE SOLICITED

OPERATE EFFICIENTLY AT USUAL CARBIDE SPEEDS, YET PERFORM BEAUTIFULLY AT THE SLOWER SPEEDS OF STEEL CUTTERS

PHONE, WIRE, OR WRITE US NOW FOR PRICES

**Severance TOOL INDUSTRIES INC.**

730 IOWA AVE. . ● . SAGINAW, MICHIGAN

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THE New WAY TO BUY GLUCOSATES*
For unsurpassed control of Scale and Corrosion in your plant.
Now even more economical and more effective!
Investigate the application of the Glucosates* to problems in your water using equipment.
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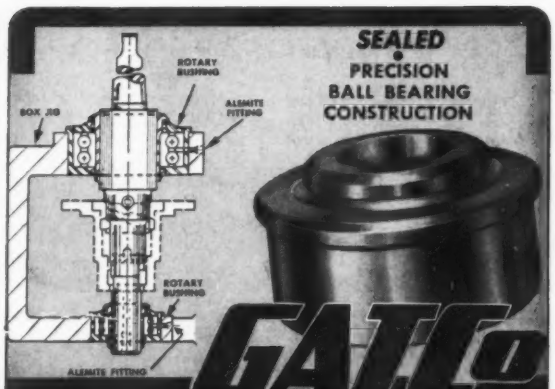


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PRECISION
BALL BEARING
CONSTRUCTION

GATCO

ROTARY BUSHINGS

*For DRILLING, CORE DRILLING, ROUGH and FINISHED DRILLING*

**The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both**

**Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.**

*Write for full information and prices*

GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., PLYMOUTH, MICH.
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CIRCLE INFORM-A-GRAM KEY NO. 1061

BURR-BIT CUTS TAPPING COST WAY-DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE OPERATION, ONE SETUP, ONE HANDLING.

**NEW ADDITION**
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾".

A quality product made of the finest high speed tool steel for use on almost every material.

**WRITE** now for complete data and reports from engineers who have adapted Burr-Bit and saved on their tapping operations. **INVESTIGATE** Burr-Bit-today.

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ALLEN AIR CORP.
*(THE LARGEST MANUFACTURER OF CYLINDERS IN MINEOLA)*

DOUBLES PRODUCTION

Using their own products helped a lot, but working 16 hours a day was the only answer.

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CIRCLE INFORM-A-GRAM KEY NO. 1062

AIR-MITE
HIGH PRODUCTION AIR PRESS
*with more Quality Features*

★ **Solid Steel Column. Greater strength and rigidity.**
★ **Brass cylinder, aluminum end castings, Hy-Car piston cups.**
★ **Accurately ground table.**
★ **Fast set-up and stroke adjustment.**

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a workhorse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

**1 Ton Capacity**
**$89.95**
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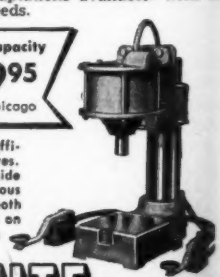


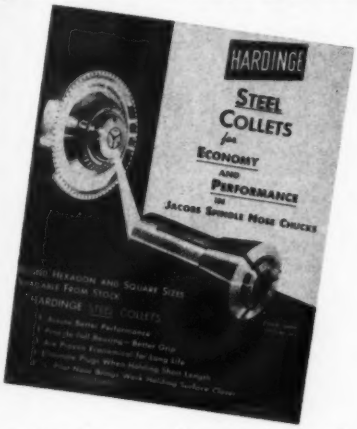
**New 3 Way Control Valve.** For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.

AIR-MITE Devices, Inc.
4405A W. KINZIE • CHICAGO, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1064

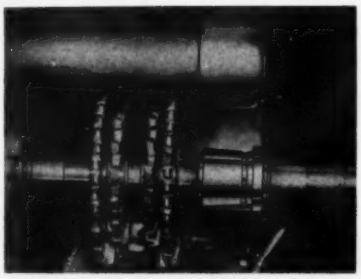
## Machining

**Steel Collets** in round, hexagon, and square types, available for users of Jacobs spindle nose chucks, are listed in a bulletin. Advantages and




specifications are given for two models. Get your copy from Hardinge Brothers, Inc., Elmira, N.Y., or Circle Inform-A-Gram No. M12.

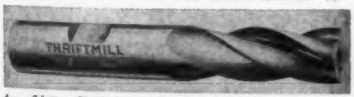
**This Roller Bearing** for milling machine overarm support now permits lubrication of bearing by milling machine overarm lubrication system. This assures proper lubrication, allows faster feeds and speeds,



and results in better finishes. Write for information to Sonnet Tool & Mfg. Co., 580 N. Prairie Ave., Hawthorne, Calif., or Circle Inform-A-Gram No. M13.

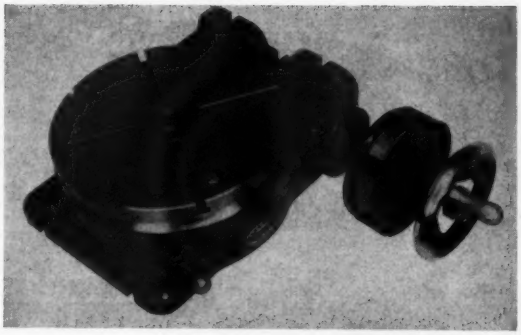
**High Production Tapping Attachment** fits conventional drill presses to tap a ¼-20 hole ⅜" deep in less than a second. Set correctly, Model 100 Tapspeedster never breaks a tap and uses standard taps to tap any material that can be drilled by high speed drills. Smith Mfg. Co., 208 St. Clair Ave., Cleveland 13, or Circle No. M14.

**High-Speed Thriftmill,** for profiling, slotting, peripheral milling, etc. saves money because it's ground from the solid in volume production. Available in six sizes from ⅛"




to ½". Cutting Tool Div'n, Brown & Sharpe Mfg. Co., Providence 1, R. I., or Circle No. M15.

**More Precise Angular Spacing** is possible with this new 11" rotary table which reads to 1 sec and has ±2 sec overall accuracy for entire 360°. Model 2 uses a non-disengageable thread-ground worm in combination with accurately spaced teeth of its mating gear. Moore Special Tool Co., Inc., 800 Union Ave., Bridgeport 7, Conn., or Circle No. M16.



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PORTELVATOR®
THE HANDY HAMILTON PORTABLE ELEVATING TABLE

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all compact, heavy loads!

Top plate locks by gravity at any attained height when hand-crank pressure is released.

EASE OF MOVEMENT
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FIVE STANDARD MODELS
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*Special*

# NOBUR Tool

. . . DEBURRS BOTH SIDES OF 3 DIFFERENT HOLE SIZES

**PROBLEM:**

**How to advantageously deburr both sides of 3 different hole sizes in a vital missile launcher part without 3 different tool changes.**

**SOLUTION:**

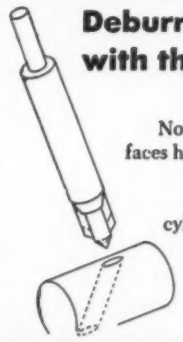
**This special NOBUR tool with 3 separate pilot diameters and a cutter blade with 3 correspondingly positioned cutter heads. Adaptable for use in a portable drill-motor.**

**RESULTS:**

**Exceptional savings in time and labor.**

*Solving deburring problems is our business —can our engineers help with yours?*

## HERE'S ANOTHER PROBLEM SOLVED

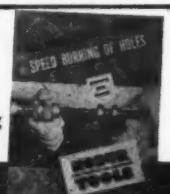


**Deburring Elliptical Holes with the *NEW!* ELLIPTI-BURR TOOL**

Now . . . deburr openly accessible hole faces having an irregular surface like those developed when holes are drilled angularly or when drilled through cylindrical bodies. This revolutionary tool is self-piloting with a two-lipped cutter that automatically follows the hole surface geometry. Write for full data.

**Write for FREE Folder**

Send for all the details on Nobur Tool Products – the key to *lower* costs, *higher* production and *improved* quality on your deburring operations. WRITE TODAY!




NO/BUR TOOLS **NOBUR** MANUFACTURING CO.
6860 Farmdale Ave. No. Hollywood, California

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# GET THIS NEW GRIPCO FASTENER MANUAL FREE!

This new technical bulletin gives all the engineering data and outstanding features of the Gripco line of locking fasteners, including Gripco Lock Nuts, Centerlock Nuts, Gripco and Centerlock Hi Nuts, Gripco and Centerlock Jam Nuts, Pilot-Projection Weld Nuts, Countersunk Weld Nuts, Clinch Nuts, the new Miniature Clinch and Weld Nuts, as well as Standard hexagon nuts in Steel or Brass. Full or Jam dimensions. Profusely illustrated, complete with application information on the self-locking features of the Gripco line, this manual should be in the hands of everyone who is faced with a fastener problem.

123

*Send for yours today.*

GRIP NUT COMPANY
107 Maple Street South Whitley, Indiana

CIRCLE INFORM-A-GRAM KEY NO. 1082

# NEW CHAMPION®

***high production expanding mandrel***

"Lok-Tite" series expanding mandrels with quick-taper design give automatic release of workpiece. They are used between centers, chucked, face plate or rotary table mounted. Threaded nut or drawbar clamped. Precision of .0004" T.I.R. is guaranteed. Twelve arbors with a wide range of sleeves will handle all holes from ½" to 15" I.D.

***Send for free catalog giving complete line, specifications and prices***

THE WESTERN TOOL & MANUFACTURING CO., INC.
SPRINGFIELD, OHIO FAIRFAX 3-9151

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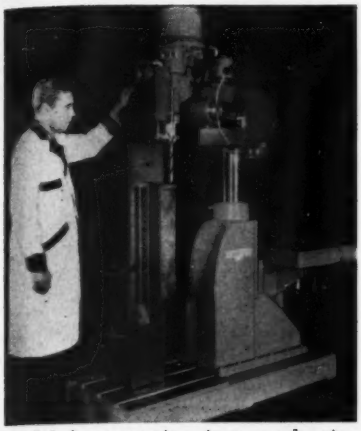
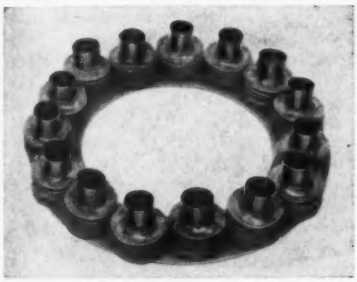
## Machining

**Wider Range and Greater Capacity** of radii are features of the new expanded line of radial drills from I. O. Johansson Co., Skokie, Ill. This



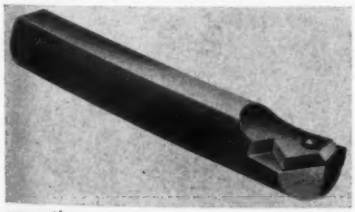
model incorporates two work stations, accessible through 360° rotation of ram, and features 21½″ x 24″ rear work platform and 20″ x 28″ or 20″ x 40″ adjustable table in front. Company supplies information, or Circle No. M17.

**New Type Multiple-Head Protector** is for multiple-die punch presses and drilling and tapping machines. Any number of vertical or horizontal spindles may be equipped with



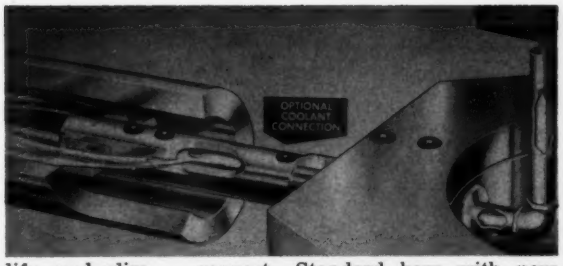
the accordion, telescoping sleeves. They come in many sizes and materials. A & A Mfg. Co., Inc., 712 S. 12th St., Milwaukee, Wis., or Circle Inform-A-Gram No. M18.

**Two New Styles of Standard Non-Adjustable Boring Bars** that use throwaway carbide inserts have been announced by Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich. Styles AS and AT are for



operations not requiring diameter micro-adjustment and are available with negative or positive 5° rake, in 1¾″ to 3″ sizes. Write company for details, or Circle M19.

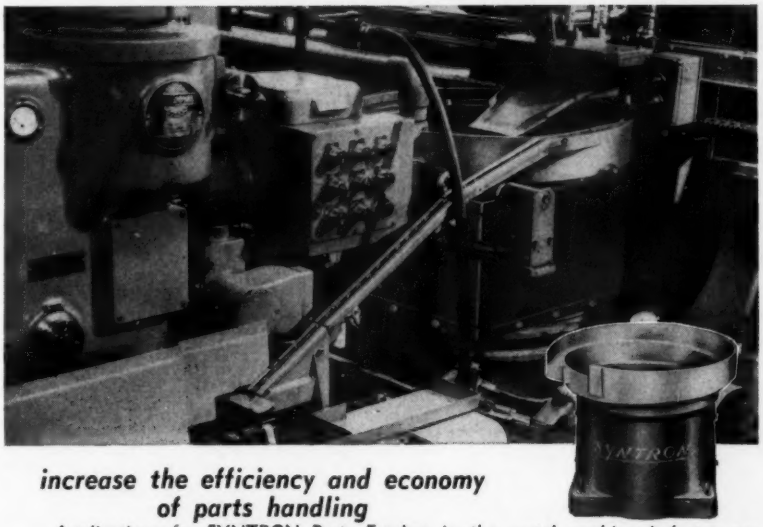
**Boring Bars** with coolant veins engineered into cutting edge, reduce chip interference, ease chip removal, and eliminate intermittent heating and cooling. Other advantages include uniformly smooth finish on all boring jobs, extended tool life, and elimination of many make-shift coolant systems for special jobs. New feature is available in standard sizes from stock and in special bars upon




request. Standard bars with new coolant-engineered features are listed in new catalog from Vee Bee Mfg. Co., 2632 Park St., Muskegon, Mich., or Circle Inform-A-Gram No. M20.


SYNTRON **Vertical Vibratory**

# PARTS FEEDERS



***increase the efficiency and economy of parts handling***

Applications for SYNTRON Parts Feeders in the metal working industry are unlimited.

Whether its orienting and feeding parts to machining, assembling, packaging or other automatic operations, SYNTRON has a parts feeder to do the job—more efficient, more dependable and more economical than by slow manual methods.

Custom built, SYNTRON Parts Feeder bowls can be fabricated to orient parts of almost every size, shape, and material. This—plus instantly controllable, high-frequency vibration (3600 vibrations per minute)—assures the maximum flow of parts to meet the requirements of continuous, automatic production lines.

SYNTRON Parts Feeders with electromagnetic drive provide a positive, dependable vibration to move most parts efficiently and at high rates, yet gentle enough to handle delicate, precision parts without damage.

SYNTRON Parts Feeders can increase the efficiency and economy of parts handling. Write for detailed information.

**SYNTRON COMPANY**

**341 Lexington Ave. Homer City, Penna.**

**Other SYNTRON Equipment of proven dependable Quality**

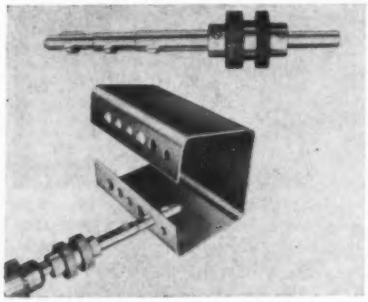
**LAPPING MACHINES**

**TRANSFER & STORAGE FEEDERS**

**BATTERY CHARGERS**

CIRCLE INFORM-A-GRAM KEY NO. 109

## Machining



**Single Special-Purpose Tools** deburr front and back hole faces of three different size holes without separate tool changes. Available in three models, they have retractable cutting blades for added safety. Nobur Mfg. Co., 6860 Farmdale Ave., N. Hollywood, Calif., or No. M21.

**Landis Thread Rolling Heads** are featured in a bulletin which gives construction features, dimensional drawings, and specifications for No. 5 and No. 7 Series. Contact Landis Machine Co., Waynesboro, Pa., for Bulletin F-99-1, or Circle Inform-A-Gram No. M22.


5 Basic Reasons why
MARVEL HACK SAWS
CUT-OFF MORE ACCURATELY...

The consistently accurate performance of MARVEL Heavy Duty Hack Saws is no accident. MARVEL engineers knew, many years ago, that to produce and maintain accurate cutting-off, a hack saw must be designed and built like a fine machine tool.

Some of the basic design principles built into the modern MARVEL Hack Sawing System that makes it the most accurate cutting-off method you can use are:

1. V-Way Design...Greater Rigidity

Upright and Saddle are precision machined and fitted to form a rigid, integral unit capable of withstanding any cutting load with no deflection or side movement.

2. Anti-Friction Bearing Construction

Anti-friction ball or roller bearings are used at all load carrying points. Even the strongly braced saw frame reciprocates on heavy duty, fully enclosed preloaded ball bearings which provide permanent, frictionless rigidity and true-running, straight line cutting strokes.

3. Minimum Blade Frame Reach

Close-coupled design and crank lever action of MARVEL Saws keeps the saw frame and blade reach very short in relation to the vertical V-ways on which the unit is mounted. This insures optimum rigidity, even under the most severe operating conditions.

4. Positive Relief Blade Lift

On the return stroke, positive relief lift raises the blade to provide proper and "cushioned" load-in on the next cutting stroke. This prolongs blade sharpness, life and accuracy.

5. Rigid Cutting Tool

Cutting-off accuracy requires a rigidly held, relatively short cutting tool. MARVEL Unbreakable High-Speed-Edge Hack Saw Blades, which combine a narrow high speed steel cutting edge permanently welded to a tough alloy steel body, can be tensioned from 200% to 300% more taut than ordinary blades. This provides a most rigid cutting edge.

Catalog C85 has complete details, facts and figures on both Marvel metal cutting Hack Saws and Band Saws. Write for it today.

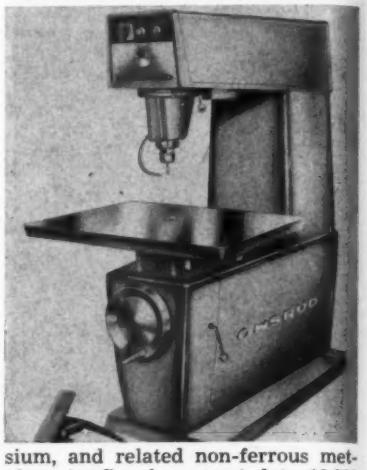
PS-1308

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO.
5700 W. BLOOMINGDALE AVE., CHICAGO 39, ILL.

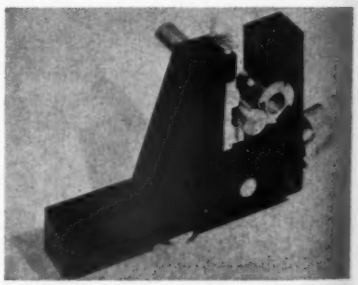
CIRCLE INFORM-A-GRAM KEY NO. 110


**Easier Tooling and Setup** are features of the new heavy-duty 1024 and 1036 routers announced by Onsrud Machine Works, Inc., Machine Tool Div'n, 7774 Lehigh Ave., Niles 48, Ill. Machines aluminum, magnesium, and related non-ferrous metal parts. Can be operated to 10,000 or 20,000 rpm spindle speed and table tilts to 45° angle. Bulletin 1173 available from Onsrud, or Circle Inform-A-Gram No. M23.



**"The Evolution of a Modern Cutting Fluid"** describes development of coolants and features Hocut 237 for handling metal cutting jobs when mixed with various proportions of water. Get a copy from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, or Circle Inform-A-Gram No. M24.

**Honing Tools Fit Lathes,** drill presses, or grinders to handle all external honing from 1/10" to 2¾". Open throat allows setup behind shoulder or between centers without disassembly, and rotating backup shoe permits quick size selection. Stones available in various sizes and grades. M. Dudgeon Co., 2011 S. English, Pittsburgh, Kan., or Circle No. M25.



**A Heavy-Duty Metal Cutting Machine** bulletin covers the Imperial line of radial-arm type machines. Construction features and possible applications are given along with a list of specifications. DeWalt Div'n of American Machine and Foundry Co., Lancaster, Pa., supplies copies of Catalog SP-110-57A, or Circle Inform-A-Gram No. M26.

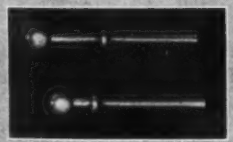
**SHALLOW HOLE GAGES**
For both I.D. and O.D. — gaging action reversible in 30 seconds without disassembly. Three models: ¾" to 5½", 9", or 16".

**SNAP RING GROOVE GAGES**
Three bore gaging ranges: .240 to 1.920; 1.446 to 2.710; 1.840 to 5.270.

**"O" RING GROOVE GAGES**
Wide variety of styles and ranges.

**DEPTH GAGES**
Fully adjustable from 0 to 6¾" without changing rods. Other models with range up to 20".

**BORE GAGES**
Eight models, for precision gaging of bores from .125" to 8".



**TOOLING BALLS**
For inspection, tool room, and jig shop work. Complete range of sizes. Attractive discounts on quantities.

**For Precision, Production, and Economy Standardize on**

**HEMCO**

***Reli-A-Chek***

# DIAL INDICATOR GAGES

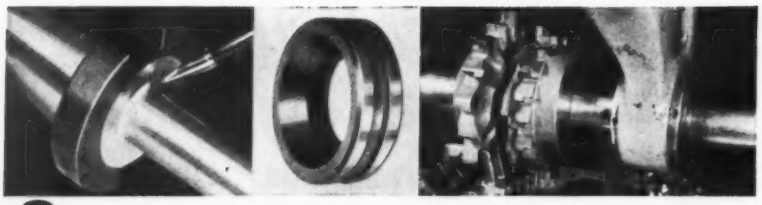
**Perfectly Balanced, Simple in Design, Easy to Handle — Speed Precision Gaging Throughout a Wide Range of Work**

*MANUFACTURED BY FINE CRAFTSMEN*
*FOR PRECISION, DURABILITY, SATISFACTION*

**SNAP GAGES**
Fully adjustable for both I.D. and O.D. work. Two sizes to cover 0 to 6" range.

**H. E. MORSE CO.**
**HOLLAND, MICHIGAN**

*Write for Literature and Prices*

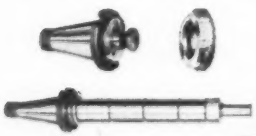


# improve setup accuracy, cutter life

**...with Scully-Jones milling arbors—** large end bearing and oversized end collar give you a perfect fit and added protection against runout when spacers and cutters are "snubbed up." New 45° chamfer in end collar leaves plenty of clearance over the fillet. Larger size makes it easy for operator to identify end collar—prevents mistakes when setting up. More accurate setups mean each tooth in the cutter takes its share of the load. Larger 3/16" radius between arbor body and shaft eliminates stress points, reduces possibility of breakage under heavy loads. S-J shell end mill arbors increase accuracy, too, because taper is held within .0002", with 10-20 microinch finish. Call your Scully-Jones representative or distributor for service on arbors, solid and adjustable spacing collars, shell end mill arbors, and precision sleeves. Look in the Yellow Pages, or phone us—BIshop 7-5900.

***Scully-Jones and Company***

1901 S. ROCKWELL ST. CHICAGO 8, ILLINOIS • PHONE BISHOP 7-5900



SCULLY JONES **MILLING ARBORS**

CIRCLE INFORM-A-GRAM KEY NO. 1121

## GRIND-DEBURR-POLISH

**Faster and Easier with a**

## DREMEL MOTO-TOOL

No other grinder, regardless of size, power, or price can take the place of the Dremel Moto-Tool. It's lightweight (16 ounces) and handles like a pencil. Gives the operator extreme accuracy for close-tolerance work—and easy operation in tight places impossible to reach with large grinders. The Moto-Tool's high speed (27000 RPM) makes it ideal for use with small mounted wheel points. It's also handy for production deburring, and a perfect size and weight for women operators.

The Dremel Moto-Tool is an indispensable, all-purpose grinder for the tool room—a time-saver for the production line—an industrial favorite since 1936.

**Order from Your Supplier or Write for Tool Catalog**

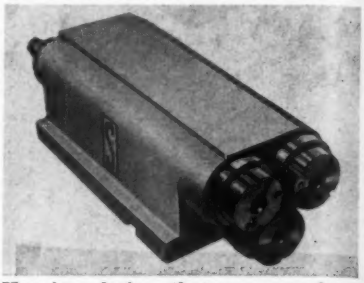
Model No. 2 Moto-Tool only .. **$19.95**
Model No. 2 Moto-Tool Kit with 23 accessories and storage case .. **$27.50**

**DREMEL MFG. CO., Dept. 529F, Racine, Wisconsin**

CIRCLE INFORM-A-GRAM KEY NO. 1122

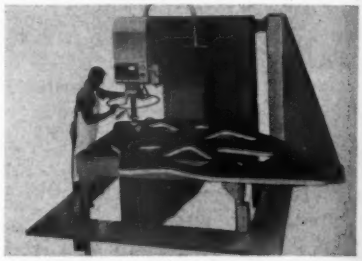

## Machining

**A New Cluster Design of Boring Spindles** has been introduced by The Standard Electrical Tool Co., Mt. Hope & 6th Sts., Cincinnati 4. Each unit incorporates two or more super precision boring spindles.



Housing design that accommodates multiple spindles is directly related to multiple holes to be machined. Details available from company, or Circle Inform-A-Gram No. M27.

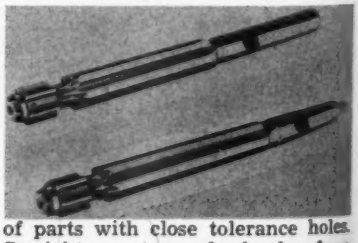
**A New Articulated Band Machine** provides great capacity for large or ungainly work by moving cutting tool instead of work. A sweeping head and link construction provides 99 sq ft of unlimited cutting area,



and 17½" continuous straight-cut length. Details of Model 5 and others are found in bulletin from The DoAll Co., Des Plaines, Ill., or Circle Inform-A-Gram No. M28.

**Edlund Drilling and Tapping Machines,** both standard and special models, are discussed in a catalog. Construction features, speed ranges, and other dimensions are given for several models. Contact Edlund Machinery Co., Cortland, N. Y., for Bulletin 140R, or Circle M29.

**Replaceable Shell** that expands to compensate for wear during use is a feature of new expansion chucking reamer. Used for low-cost high-precision reaming and mass production



of parts with close tolerance holes. Straight or tapered shanks from ½" to 1½" dia available. Standard Tool Co., 3950 Chester Ave., Cleveland 14, Ohio, or Circle No. M30.

# NOW...a new Rotary Table reads direct to 1 sec.!

*New No. 2 Moore Ultra-Precise Rotary Table, developed by the builder of the Moore Jig Borer and Jig Grinder. Moore also offers you a rotary table which reads to 5 sec. and has overall accuracy of 6 sec.*

## ...meets the demand for precision angular spacing never possible before

With the new No. 2 Moore Ultra-Precise 11-inch 2 sec. Rotary Table, you can provide the closest precision angular spacing needed today. It reads to 1 sec. and has an overall performance accuracy of ± 2 sec. throughout the entire 360°.

This kind of accuracy is achieved through the use of a nondisengageable, thread-ground worm in combination with the accurately spaced teeth of its mating gear. The worm and gear are burnished together to glaze and work-harden their perfectly matched contact surface. Loss of accuracy resulting from the repeated throwing in and out of the worm is eliminated.

A unique corrective lapping technique achieved by an ultra-sensitive method of angular measurement... interferometric inspection and calibration...produces tooth spacing accuracy within less than ± 2 seconds.

Accurate in either horizontal or vertical position, this new Moore Rotary Table is ideal for countless precision spacing applications on jig borers and jig grinders. Further applications are possible by using the table in conjunction with its companion unit, the Model No. 2 Sine Plate, to produce compound angle settings. *Write today for complete information about this new Moore table.*

**GUARANTEED POSITIONING ACCURACY FOR SHOP USE**

All points in 90° increments, from zero to ± 1 Sec.
All points in 18° increments, from zero to ± 1 ½ Sec.
All points in 2° increments, from zero to ± 1 ¾ Sec.
Worm accuracy — ¼ Sec.
Repetition of settings — ½ Sec.
Total error in any position — 2 Sec.
2 Sec. = 0.00005 (½ tenth) on 10" dia.

*Accuracy assured by interferometric inspection and calibration. This is the first industrial division of the circle by light-wave measurement.*

**MOORE SPECIAL TOOL COMPANY, INC.**
**726 Union Avenue, Bridgeport 7, Connecticut**

**ADD MOORE TOOLS TO YOUR TOOLROOM**

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 113

LASTING

*precision in millionths*

Fonda's hardened steel blocks, with their unusually high carbon content, give continuing accuracy long after *other* gage blocks have worn out!

. . . and for the ultimate in durability, Fonda's TUNGSTEN carbide blocks will far outlast *any* other gage block.

Blocks are available in an unusual range . . . both square and rectangular, and in sizes down to the *new* ultra thin .010 series . . . write:

FONDA
GAGE COMPANY
Factory and General Offices
Stamford, Connecticut

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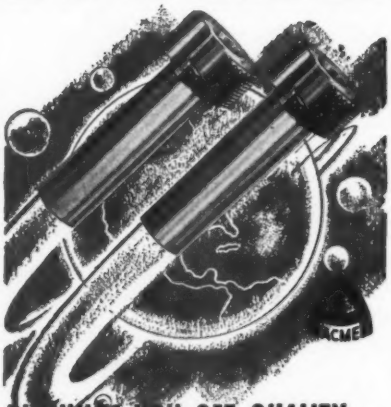
with ACME



BUSHINGS YOU GET QUALITY . . .
PRECISION . . . AND FAST DELIVERY!

Send me your FREE drill bushing SELECTOR.
Name
Firm Name
Address
City State
ACME INDUSTRIAL CO.
213 North Laflin St. • Chicago 7, Ill.

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WANT HIGH-SPEED MEASUREMENTS TO 20 MILLIONTHS...

CARSON-DICE
ELECTRONIC MICROMETERS

If you need to measure fragile or compressible parts to within .000020", then CARSON-DICE Electronic Micrometers are for YOU!

J. W. DICE CO.
ENGLEWOOD, N. J.

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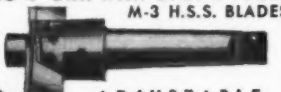
HOLES
1" TO 4" DIA. WITH ONLY 5 TOOLS
M-3 H.S.S. BLADES



Clark ADJUSTABLE COUNTERBORES
P.O. BOX 990 BEVERLY HILLS, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1144


## Machining

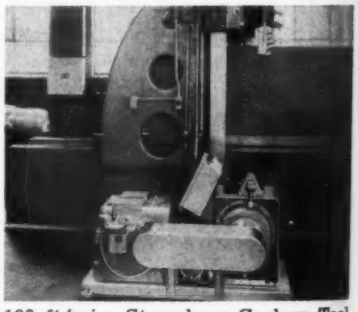
**A Forty-Page Catalog** of carbide tool products gives complete technical data and prices for solid carbide, standard blanks, indexable throw-away inserts, on-end inserts, and toolholders. Catalog MT-059 is made available by Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, or Circle No. M31.

**Unlimited Production Versatility** is major feature of new industrial 17" drill press line. Capacities are 0-½" key chuck; ¾" dia hole in cast iron, and ⅝" dia hole in steel.

Get details from Rockwell Mfg. Co., Walker-Turner Div'n, Dept. 1005, 400 N. Lexington Ave., Pittsburgh 8, or Circle Inform-A-Gram No. M32.

**Cutters, Reamers,** and special tools are listed in a bulletin that gives dimensions for stock items and gives examples of reamers, end mills, and different high speed steel precision cutting tools. Write to Special Cutter and Tool Co., 401 Salliotte St., Ecorse 29, Mich., for a bulletin, or Circle Inform-A-Gram No. M33.

**Eliminate Heavy Belting** on old or new planers with this compact conversion unit. Imparts a chatterless cutting action to the table even when taking heavy cuts through alloy steel. Surface speeds from 5 to



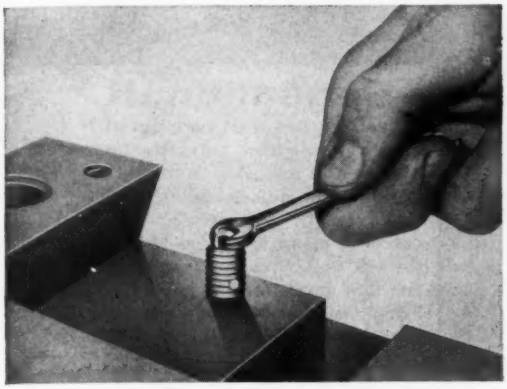
100 ft/min. Stromberg-Carlson Tool & Die, 226 E. 16th St., Traverse City, Mich., or Circle Inform-A-Gram No. M34.

**"Producto Die Sets** and Accessories" contains a 56-page catalog listing specifications for catalog die sets, special die sets, and die accessories. A 20-page price list is also included. Write The Producto Machine Co., Bridgeport 1, Conn., for a copy of Catalog 11, or Circle Inform-A-Gram No. M35.

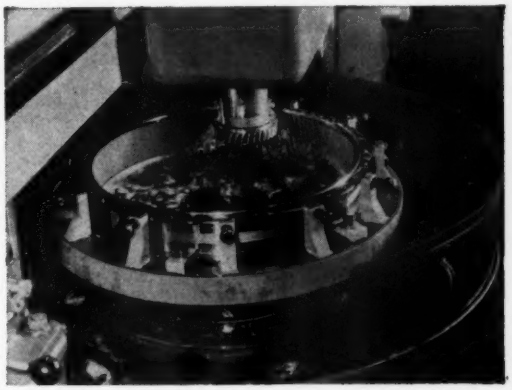
# Practical Tooling Tips

*No. 4 of a series*

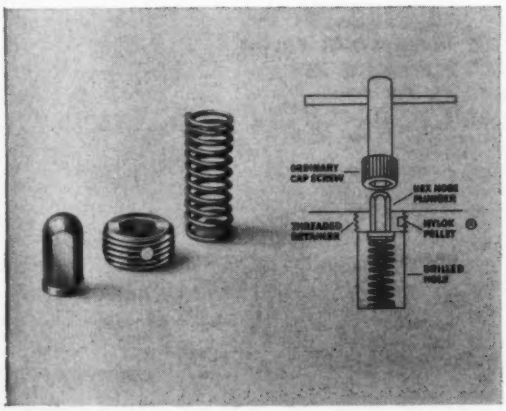
New uses are being found every day for Vlier Tooling Accessories. Perhaps the applications shown below will suggest ways you can profit by replacing costly, custom devices in jigs, dies and fixtures with precision, off-the-shelf Vlier products.



**HEX NOSE SPEEDS INSTALLATION OF SPRING PLUNGERS**—Vlier Hexnose Spring Plungers are easily installed with a simple end wrench. Eliminates hunting for special wrenches. Made to same exacting tolerances as Vlier Standard Spring Plungers. Available in many end pressures, diameters and lengths.



**THIN-WALLED RING GEAR HELD SECURELY** in fixture without distortion with 12 Vlier Torque Thumb Screws. Once pre-set end pressure is reached, knurled head spins freely, preventing overtightening. Checknut prevents backing off under vibration. Available in four types; various screw diameters and lengths.




**NEW PLUNGER ASSEMBLY PREVENTS DAMAGE TO DIE STOPS**—Plunger actuates automatic stop perfectly. Quickly installed, never needs adjustment. Hex nose mates with standard hex head bolts for easy insertion. Nylok® nylon pellet prevents threaded retainer from working loose. 6 sizes from ¼" to 1" diameter. Various end pressures.

**FREE IDEA BOOKLET**—Illustrations in this 16-page booklet show how others have profited from the use of Vlier Tooling Accessories. Shows both the usual and unusual applications. May suggest ways *you* can save. Write for your copy today.

**VLIER**
Engineering Corporation
*A subsidiary of Barry Controls, Inc.*
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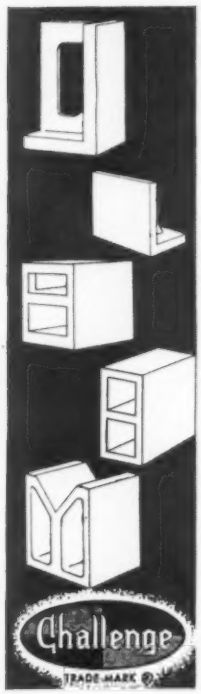
CIRCLE INFORM-A-GRAM KEY NO. 115

# For MORE ACCURATE MACHINE SET-UPS




## CHALLENGE

**ANGLE PLATES • ANGLE IRONS**
**BOX ANGLES • V-BLOCKS**
**and BOX PARALLELS**

These Challenge products provide a practical means of clamping and holding work for precise measurement and machining. Many machinists also use these units not only as a base for their precision fixtures but as a part of the fixture itself — thus increasing accuracy while eliminating a step of manufacture.

The precision that is part of every Challenge unit extends all the way up to 10 x 20 ft. Surface Plates. Whatever your precision problem may be—standard or special sizes —Challenge has the best answer for you. See the complete line by writing for the latest Challenge Precision Catalog or ask your Industrial Distributor.

SE-117

**THE CHALLENGE MACHINERY CO.**
**Grand Haven, Mich.** Dept. TP-6

CIRCLE INFORM-A-GRAM KEY NO. 1161

# USE THIS NEW KIND OF DIAMOND CUT-OFF WHEEL

Gives narrower, smoother cuts on industry's toughest materials

**...yet prices start at only $32.25**

Now... at *production prices*... DIATRONIC gives you a rim width of .006" that's accurate to a maximum total tolerance of .0005"—or your money back. This accuracy is built in by a new process. No break-in needed. New narrow cut reduces sawdust loss 30%. A must for $3,000-a-pound silicon or germanium crystal. Cuts tungsten carbide, corundum, aluminum oxide, glass... practically anything. Stock orders shipped in hours; special wheels available. Write for literature, price list.

*Another invention marketed by*
**NAVAN PRODUCTS, INC.**
Subsidiary of North American Aviation, Inc.
**Dept. 212, International Airport, Los Angeles 45, Cal.**

**DIATRONIC* DIAMOND WHEELS**
"with built-in tolerance" *TRADEMARK

CIRCLE INFORM-A-GRAM KEY NO. 1162

# MIDGET MUFFLERS Ready!

M-1 ONLY $1.95

## Sensational!

**Industry's handiest new devices! They're made from polyether foam enclosed in anodized aluminum — they silence noises caused by exhausting air. Rust-proof; common solvents clean 'em! Use M-1 or 2 for 1/8" or 1/4" exhaust ports; M-3 for 3/8" port. Order your Mead Midget Mufflers direct or send for name of nearest Mead Distributor.**


M-2 $1.95


M-3 $2.50

**MEAD** SPECIALTIES COMPANY

4114 N. Knox Ave.,
Dept. HA-69
Chicago 41, Ill.

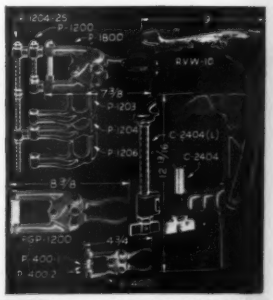
CIRCLE INFORM-A-GRAM KEY NO. 1163

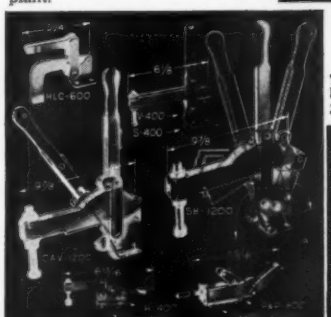
**THERE ARE KNU-VISE PRODUCTS TO MEET YOUR EVERY CLAMPING NEED**

*(OVER 150 MODELS)*

**LAPEER devices are the choice of leading manufacturers for all operations requiring fast and reliable clamping.**

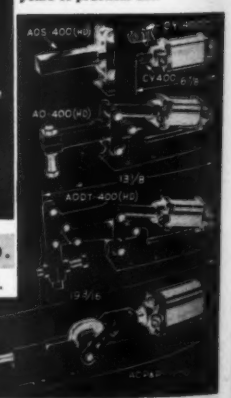
Recognized as clamping engineers we can give you much valuable assistance. We will gladly discuss your clamping problem at your plant.





**UNMATCHED FOR RUGGED USE, DEPENDABILITY, SPEED AND LONG SERVICE**

**They were developed through exhaustive tests in laboratory and years of practical use.**



**LAPEER MANUFACTURING CO.**
**3064 DAVISON ROAD, LAPEER, MICH.**

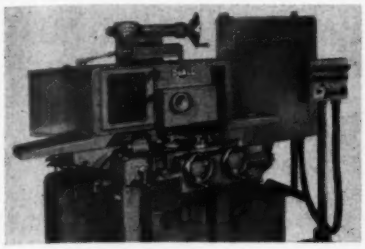
**Manufacturers of over 150 models of manually and air-operated clamps and pliers.**

**WESTERN DIV.: PECK and LEWIS CORP. 4436 Long Beach Ave., Los Angeles 58, Calif.**
**CANADIAN DIV.: HIGGINSON EQUIP. SALES, 1131 Pettit Road, Burlington, Ontario**

CIRCLE INFORM-A-GRAM KEY NO. 1164

## Machining

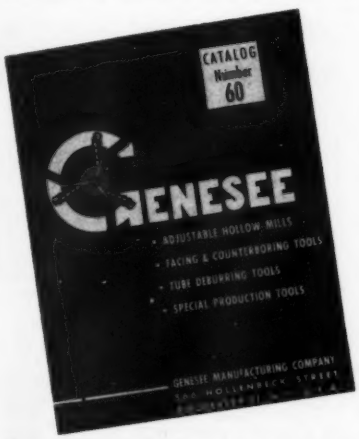
**New Slicing Machine** combines both accuracy and high production rates necessary in the production of transistors. Model MTA-7 is also



useful for slicing ceramics and new tough materials used in missile and atomic power work. Get details from The DoAll Co., Des Plaines, Ill., or Circle Inform-A-Gram No. M36.

**Kendex Button Inserts** are now available in Kennametal K11 carbide that is used under certain conditions for light cuts on steel and for machining unfired ceramic materials. This carbide is also recommended for die inserts for compacting ceramics and abrasive wheels. Write Kennametal Inc., Latrobe, Pa., for details, or Circle Inform-A-Gram No. M37.

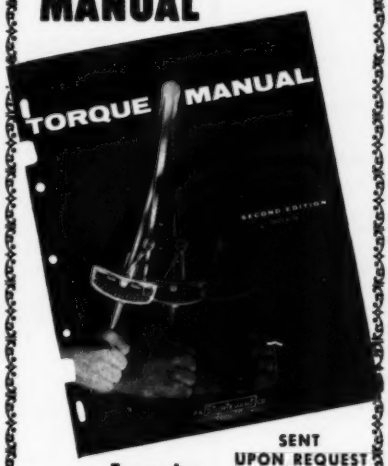
**Genesee Adjustable Hollow Mills,** facing, counterboring, and tube deburring tools are listed in a 48-page catalog that gives complete specifications and detailed drawings of all




items. Step by step pictures show how to grind hollow mill blades with grinding fixture and standard cutter grinder with swivel vise. Get Catalog 60 from Genesee Mfg. Co., 566 Hollenbeck St., Rochester 21, N. Y., or Circle Inform-A-Gram No. M38.

**"Cemented Carbides for Industry"** is a 32-page bulletin which includes new information on brazed tools, carbide inserts, toolholders, and blanks. New, lower prices are given for many new and old style tools. Get Catalog C-16-A from Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, or Circle Inform-A-Gram No. M39.


**"TORQUE WRENCH" MANUAL**

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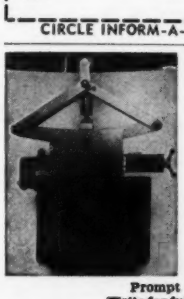

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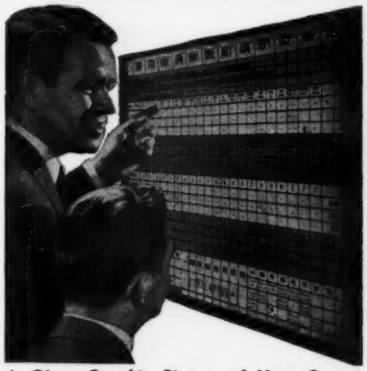

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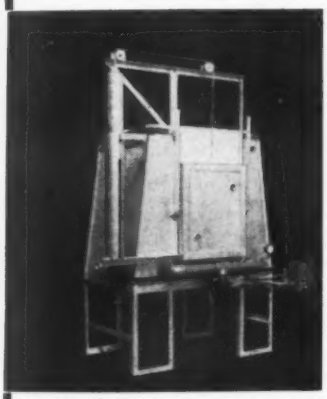

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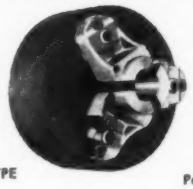

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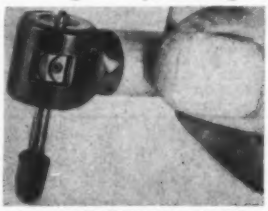

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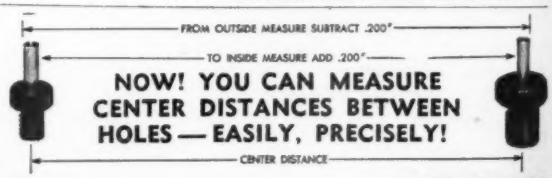


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# Numerical Control News . . .

Numerical control developments and achievements are now coming forth with such frequency that it is impossible to present a full-blown account of each new unit as it is introduced. We hope this department will become a regular T&P feature and an aid to readers who want to "keep posted on N-C."

—The Editors

## G & L's New Verticals

Giddings & Lewis' latest numerical control effort has been on vertical machine tools — boring machines and turret lathes.

The first of the boring machines (illust.) has been shipped to Gray Tool Co., Houston, for contour machining of valve bodies. It is reportedly the world's first magnetic tape controlled vertical boring and turning mill. The basic machine is from G&L's recently redesigned VBM line. It has a 54″ dia table and G&L Numeripath control system, which is a continuous path magnetic tape unit.

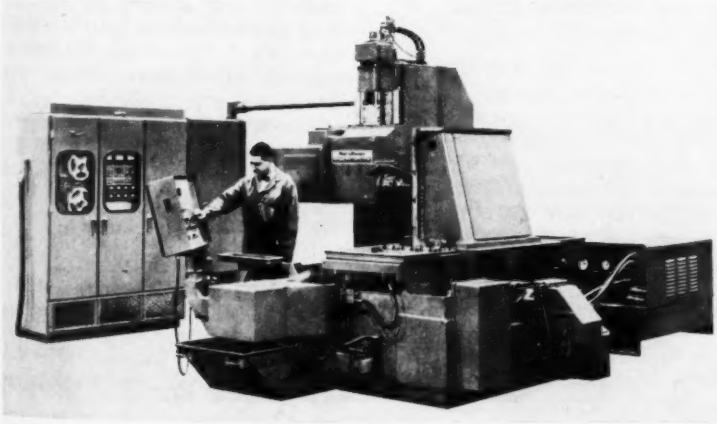
The machine is equipped with a five-position right hand turret head with power indexing, and a left hand swiveling ram type tail head. Feed and traverse of turret head, ram, and saddle can be operated by tape or pendant control, as can turret indexing and table speeds.

G&L's numerically controlled vertical turret lathes feature discrete (point-to-point) positioning, which is handled by a Numeripath control system and punched paper tape. The tape system controls feeds, speeds, turret indexing, automatic dwell, and coolant supply, as well as all auxiliary functions such as constant cutting speed, thread cutting, drum scoring, cutting of tapers, and step turning. In programming, movements of the heads and table can be coordinated to minimize cycle time and avoid mechanical interference. The tape controlled vertical turret lathes are available in 32″, 42″, and 52″ dia table sizes.

For details on the vertical machines, circle No. N2 on the Inform-A-Gram card.

## Tape Controlled Keller

Numerical controls have been added to Pratt & Whitney's Keller machines, which were originally developed as tracer controlled machines. The result is a machine that does continuous automatic milling of regular and irregular shapes in three dimensions, without templates, models, and complicated fixtures.



Horizontal and transverse movements of the work table, vertical movement of the cutter spindle, and feed rates are automatically controlled by the punched tape and Bendix tape control system.

The machine is equally capable of very heavy and very delicate work under the tape direction, with 18 spindle speeds ranging from 40 to 3600 rpm. Table travel is 36″ horizontal and 12″ transverse. The vertical slide moves 22″ and the table's working surface measures 40″ x 30″.

For full details, circle No. N3 on the Inform-A-Gram card.

**"Numerical Control In Industry" — a report on the recent Purdue University conference — will be included in next month's Tooling & Production.**

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ELECTRONIC COMPONENTS HANDBOOK—VOLUME TWO, Edited by Keith Henney and Craig Walsh. Published by McGraw-Hill Book Co., Inc., New York, N.Y., 1958. 357 pages, $12.50.

Comprehensive information on electronic components is presented in this handbook for designers and manufacturers of military and commercial electronic equipment. Selection of the proper component parts for different applications, limitations of parts, and effects of environment on parts, are discussed with emphasis on types for which military specifications are available. Components covered include power sources and converters, fuses and circuit breakers, electrical indicating instruments, printed wiring boards, solder and fluxes, choppers, blowers, RF transmission lines, and waveguides.

MODERN SAFETY PRACTICES, by Russell DeReamer. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N.Y., 1958. 357 pages, $7.

New safety methods, developed to keep pace with modern management practices and production techniques, are outlined in this guide for supervisors and safety engineers. The section on developing safe working conditions deals with human factors in machine safety, reduction of industrial noise, and personal protective equipment. It also includes an analysis of accident case histories. The author examines the effectiveness of safety committees and challenges the concept of "accident-proneness." Ideas for developing management-oriented safety programs are presented, and the role of the safety engineer in these programs is discussed. The outline of a complete safety program presented in the appendix serves as a starting point for action.

WELDING HANDBOOK — Section II, edited by Arthur L. Phillips. Published by American Welding Society, 33 W. 39th St., New York 18, N.Y., 1958. 550 pages, $9.

Gas, arc, and resistance welding processes are dealt with in this up-to-date new section of the Welding Handbook. Applications, materials, and techniques are outlined for each group of processes, and related equipment is described. A chapter on standard welding symbols, and numerous tables and illustrations, help to make this book a valuable reference.

EFFECT OF SURFACE ON THE BEHAVIOR OF METALS. Published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y., 1958. 100 pages, $10.

Surface condition has an important effect on the properties and usefulness of a metal. This collection of four papers, delivered by leading British experts to the Institution of Metallurgists, presents a great deal of information on the subject. They cover such topics as methods for examining surfaces, influence of surface treatments on chemical and physical properties, and the relationship between surface condition and frictional resistance and wear. Reasons for wear of gears, engine bores, and cutting tools, and effect of surface coatings are discussed on the basis of the physics and metallurgy involved.

MECHANICAL DESIGN AND ANALYSIS, by R. R. Slaymaker. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y., 1959. 418 pages, $9.50.

Industrial case studies are used throughout this textbook to illustrate principles of analysis and design essential to a machine designer. Professor Slaymaker's method of presenting basic theory through specific problems corresponds to the mechanics of the learning process and to the engineer's actual role as a problem solver.

The studies, used by Professor Slaymaker at Case Institute of Technology, are presented as projects requiring analysis and solution. Some of the projects cover the critical speed of a shaft assembly, bevel gear layout and design, and redesign of a commutator assembly.

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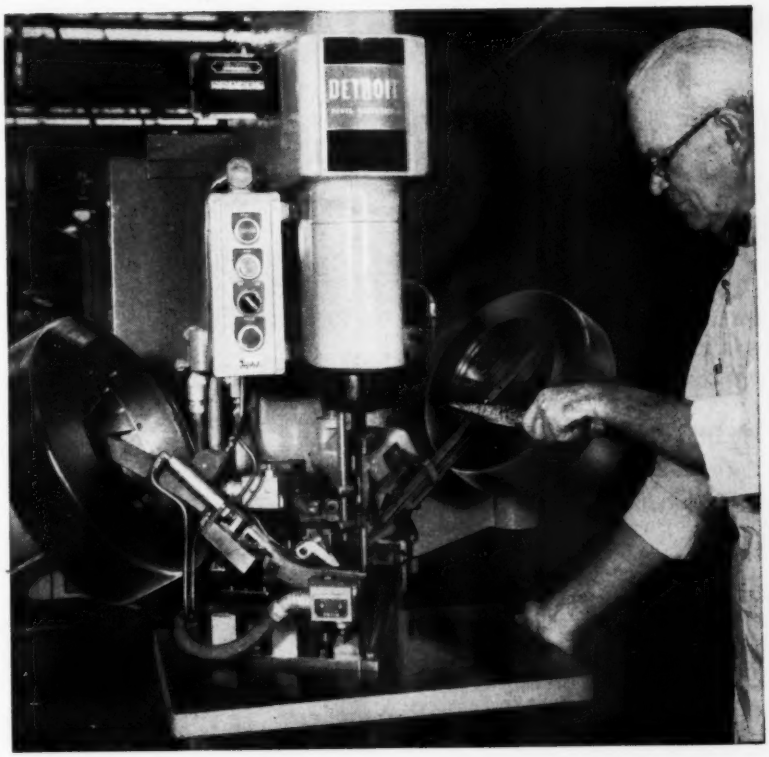

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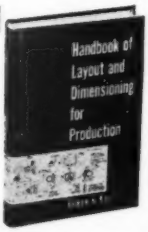


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TOOLING & PRODUCTION Magazine

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This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

*The Publisher*

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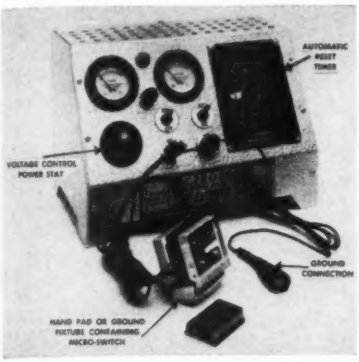
## ELECTROLYTIC ETCHER SPEEDS PARTS MARKING

An electrolytic stencil-etched mark 0.003″ deep is produced in 15 sec in ferrous metals with a new high-potential power unit developed by The Lectroetch Co. of East Cleveland, Ohio. The VT-15A cuts etching time in half.

Legible marks for parts identification, trade marks, and inspection code numbers are reproduced permanently and economically on either ferrous or non-ferrous metals. A safety-type marking fixture can be used both as a control ground pad and stencil hand pad, and must be in position against the part before pressing the single-contact microswitch.

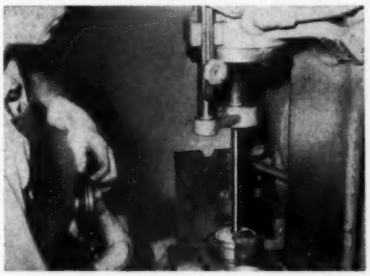

AUTOMATIC RESET TIMER
VOLTAGE CONTROL POWER STAT
GROUND CONNECTION
HAND PAD OR GROUND FIXTURE CONTAINING MICRO-SWITCH

By reducing current dwell and potential, marks of depths less than 0.003″ are controlled. Approximately 5 to 15 sec are required per 0.001″ of depth. Average ½″ dia inspection marks require only 1 to 2 amps. Marks of 1½″ to 2½″ and larger, draw up to 15 amps.

Two controls on the power unit simplify setup — Powerstat for potential control and adjustable timer for current dwell. Control is further aided by means of an ammeter (0-15) and voltmeter (0-30) which reveal power output variations for both mark depth and color consistency. Circle N4.

## BLADE LIFE INCREASED IN KEYWAY BROACHING

Over 100,000 keyways have been cut without blade replacement with a one-pass keyway push broach made by The Baj Tool Co. The broach has a replaceable blade, and is mounted in the ram of a hydraulic arbor press. Contrary to standard

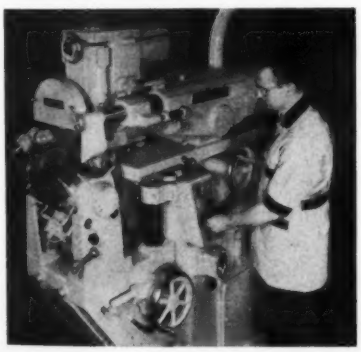


broaching practices, the tool is pulled back through the workpiece after the keyway is cut, leaving the operator with both hands free to handle the parts. Cutting speed is 17 sfpm in a ¾″ long casting with ⅞″ dia bore, and ⅛″ wide x 1/16″ deep keyway. Stroke is approximately 10″, and 300 lbs of force are required. Bushings, adjustments, and measuring are not needed with the broach because both broach and replaceable blade are factory preset for a standard width and keyway depth, with tolerance held to ±0.0005″. Circle No. N6.

## CUTTER GRINDER DOES DUO JOB

A new automatic cutter grinder, manufactured by Ingersoll Milling Machine Co., provides labor savings in the tool grinding department and increased production in the machine shop. One operator can run more than one machine.

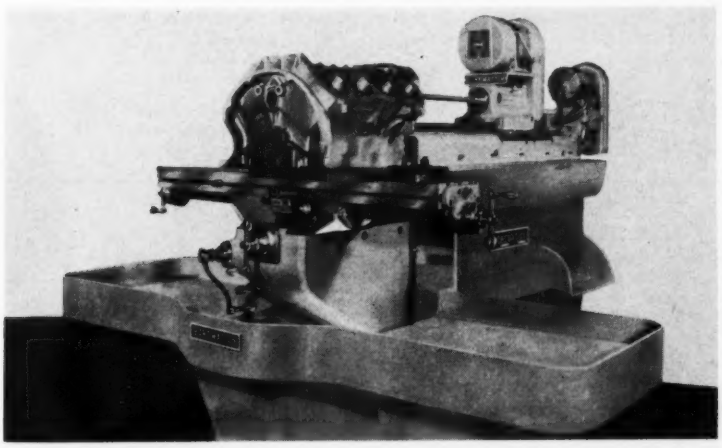
Better grinds result from its mechanically-controlled grinding action, which also lengthens cutter life and improves accuracy and finishes.



The unit can resharpen a wide range of milling cutters because it grinds on the OD, face, and bevel of cutters within its 4″ to 20″ dia capacity. The automatic unit also spin-grinds newly-filled cutters to size.

Developed specifically for grinding a variety of inserted-blade carbide cutters used in general-purpose job-shop milling, the machine provides for easy and rapid setups from one size and type of cutter to another. As the grinding wheel wears, spindle speed automatically increases to maintain constant surface speed, and the wheel is automatically dressed. A built-in dust collection system protects moving parts from dirt. Circle No. N5.

## VERSATILE, ACCURATE NEW GUN DRILLING UNIT



The new Boremation unit gun drills or bores precise holes from the solid in one pass with "jig borer accuracy." Once the workpiece is clamped to the traversing table, subsequent operations can be performed in the one hole location. If a series of holes are to be drilled in different locations, each new one can be located without removing workpiece, with the easily read and operated hand dial. For extra precise hole alignment, optics, measuring standards, or dial gages are available, says Drillmation Co., Inc., 6500 E. 11-Mile Rd., Center Line, Mich. For details, circle N7.

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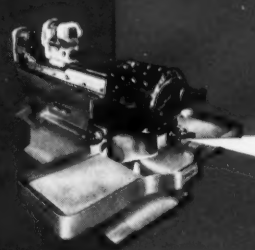

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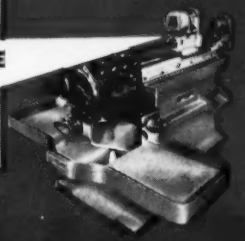

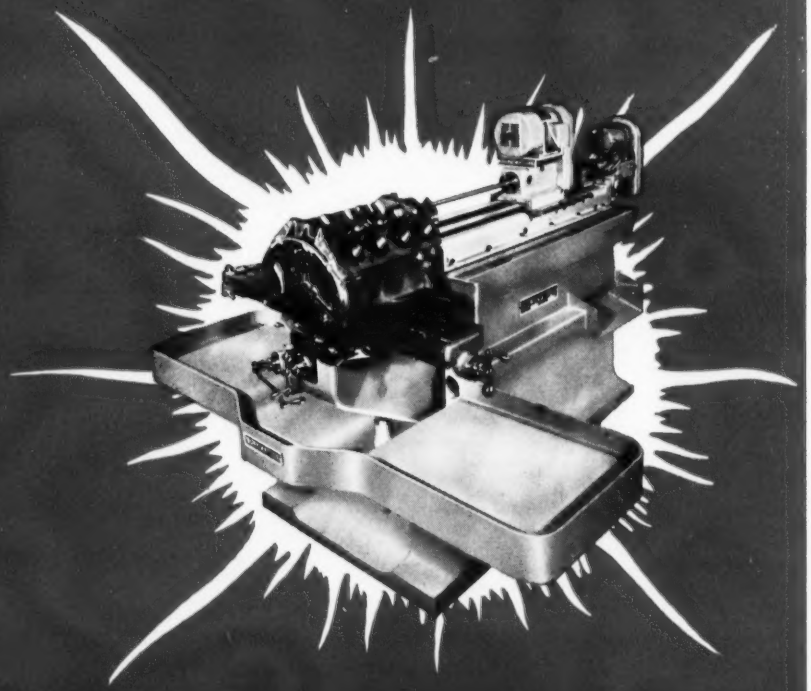

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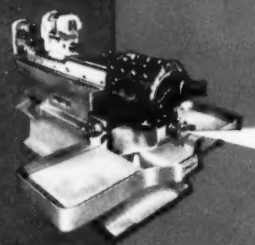

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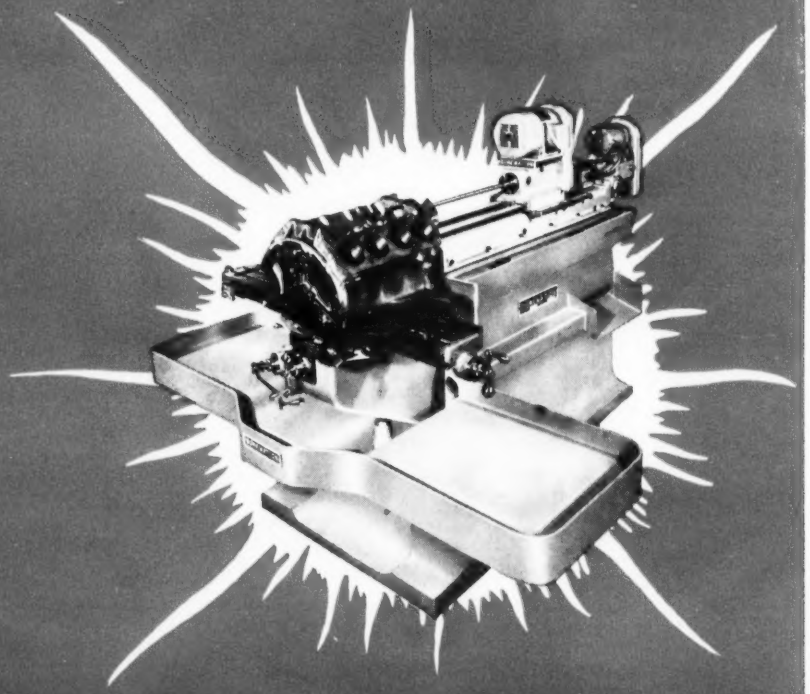

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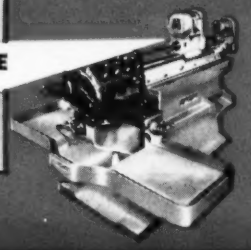

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